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EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

Observe — Compare — Reflect — Record.

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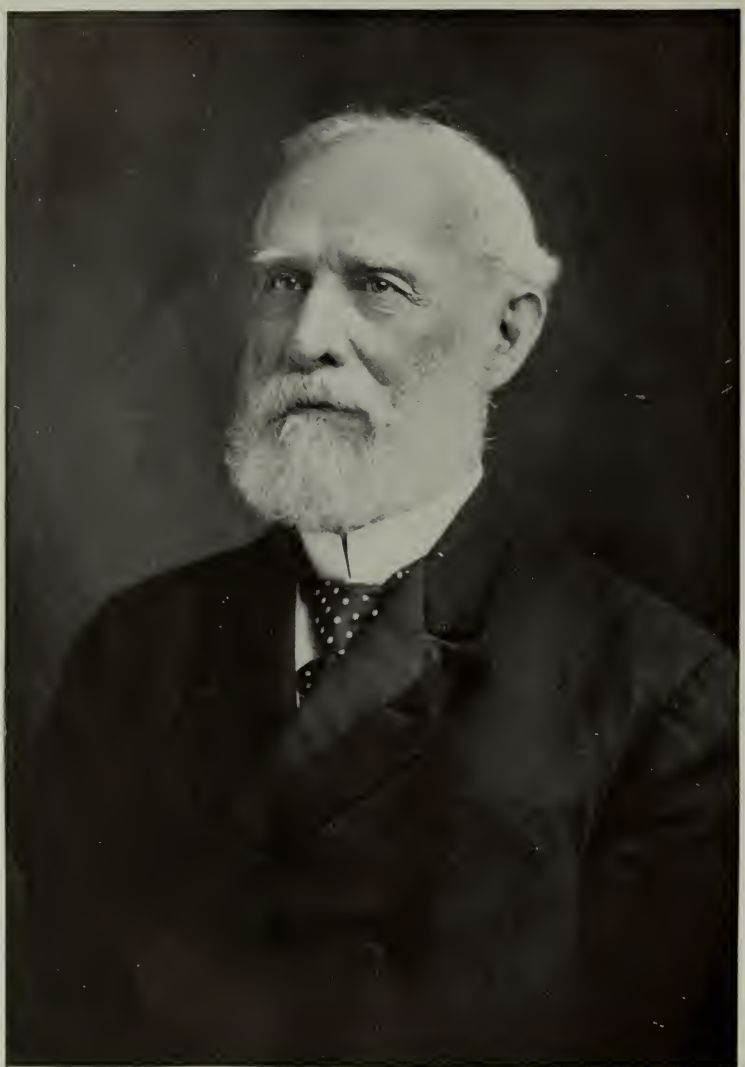

DR. JAMES TRUMAN.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

RATIONALE OF THE USE OF BACTERIAL VACCINES IN PYORRHEA ALVEOLARIS.

By A. PARKER HITCHENS, M.D., Glenolden, Pa.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Philadelphia, Pa., June 30, 1914.)

SPECULATION as to the reasons why we succumb to certain diseases, how we throw them off and are thereafter no longer susceptible to them, is as old as history. The scientific study of these questions, however, dates only from the discovery of bacteria and of their relation to infectious disease. Out of these studies have developed methods by which the body may be assisted either to prevent disease-producing germs from gaining a foothold, or to eliminate them after they have become established.

It is, therefore, not surprising that dentists, confronted with the difficult problem of pyorrhea alveolaris, have early looked to these methods for assistance. The results, moreover, have been so encouraging that before long bacterial vaccines will be an indispensable adjunct in the treatment of this infection.

In discussing this subject, it will be interesting to review briefly the preparation of the vaccine and its administration, before considering the theories which underlie its use.

COLLECTION OF THE SPECIMEN.

For the preparation of an autogenous vaccine, the specimen must be collected in such a way as to exclude all extraneous bacteria. For this purpose Dr. Head has invented a tiny spear-shaped platinum spoon fixed in an adjustable holder. After cleansing the mouth, the gum margin and the tooth are very lightly seared with a red-hot metal instrument of suitable shape and size. The spear is then heated to redness and plunged directly through this sterilized area. After being allowed to remain for an instant, it is drawn straight out without touching anything. A properly labeled tube of suitable culture medium is in readiness, and, after withdrawing the cotton stopper with a twisting movement to remove adherent filaments, the

contents of the spoon are carefully transferred to the surface of the medium. The small quantity remaining in the spoon is spread out in a thin layer upon a microscope slide. This is allowed to dry in the air, and, together with the tube, is sent to the laboratory.

At the laboratory the slide is stained by Gram's method and studied under the microscope to determine as nearly as possible the varieties of bacteria present. An ordinary nutrient agar medium containing red blood corpuscles offers a favorable substratum for all the more common bacteria which have so far been encountered in pyorrhea alveolaris. An exception is the fusiform bacillus of Vincent, which requires such complex methods that no one has yet made the attempt to use it for a vaccine.

The best method for obtaining pure cultures of the bacteria is as follows:

Three Petri dishes containing blood agar are held in readiness. With a platinum loop, as much as possible of the material is transferred from the original culture tube into one of these dishes. If it is very dry, it may be moistened with a drop of sterile bouillon; then, with a sterile glass rod bent in the shape of the "profile" of a shovel, the material is spread over the surface of the medium. Without reinoculation, the glass rod is rubbed thoroughly over the surface of the other two Petri dishes, and the three are placed in the incubator for twenty-four hours. By the time the rod reaches the third dish, relatively few bacteria are left upon it, and each of these is so separated that, when it develops, its progeny forms an isolated spot upon the medium, which is known as a *colony*. Since it consists of but one species, it is called a *pure* culture.

All plates should be studied with a lens, by both reflected and transmitted light. The recognition and identification of these tiny colonies makes the task of isolation extremely difficult. As each type of colony is recognized, the tip of a sterile platinum wire is touched to it and then rubbed over the surface of a tube containing blood agar. After twenty-four hours' growth, these cultures are stained and examined for morphology and freedom from other bacteria. For obvious reasons, it is absolutely necessary to omit all sporogenic bacteria from the vaccine.

ANAEROBIC CULTURES.

Anaerobic cultures should also be made, since the pyorrhea pocket offers ideal conditions for the development of anaerobes. The plates may be prepared exactly as for aerobic cultures and placed in sealed jars—Novy jars, for instance —in which the oxygen is replaced by hydrogen. The addition of alkaline pyrogallic acid solution to absorb the remaining traces of oxygen is advisable.

The study of plates and the fixing of colonies is carried out in the same way as for aerobic cultures, with the addition that the subcultures are grown in anaerobe jars.

PREPARATION OF THE VACCINE.

Everything now being ready to proceed with the preparation of the vaccine, the question arises as to which of the isolated bacteria are responsible for the infection. I am in thorough agreement with Dr. C. P. Brown when he makes the following statement:

> The question of selecting the proper bacteria from those isolated in a given case is one susceptible, at this stage in our knowledge, of endless discussion. A definite and final decision cannot now be rendered. Some have started out with the preconceived idea that the cocci only are pathogenic. They have discarded the bacilli present without further consideration. Goadby and others have attempted to pick out the bacteria responsible for the infection by a determination of the opsonic indices to the germs isolated. More recently the complement fixation test has been suggested for the same purpose. Such investigations may be of great scientific interest, but I must question their practical value. Besides increasing out of all proportion the labor required for the preparation of the vaccine, I believe the chances for error both in technique and in interpreting the result obtained are so great that one may not safely eliminate any organism present in the specimen. We believe it is better to make a

vaccine containing all the different types found, discarding only those obviously non-pathogenic or sporogenic bacteria.

A small quantity of sterile physiological saline solution (0.85 per cent.) is added to at least one tube of each type of micro-organism. After the growth is scraped from the surface of the medium with a platinum loop and suspended in the salt solution, the suspension is transferred to a sterile test tube, which is sealed off in the blowpipe flame. It is shaken thoroughly to break up clumps of bacteria, and a small quantity is removed for counting; the tube is re-sealed and immersed in a water-bath at a temperature not exceeding 60° C. for at least one-half hour. After the bacteria have been killed, the suspension is diluted with sterile physiological saline solution so that the final product will contain a certain number of bacteria per cc.

Many methods of counting have been suggested, but the method of Wright retains its popularity. A capillary pipet is furnished with a rubber teat, and marked with a blue pencil about one-half inch from the end. The finger of the operator is pricked just back of the nail, and as the blood runs out it is drawn into the capillary tube exactly to the mark. Removing the capillary end, the column of blood is allowed to travel up the tube for a short distance; then the tube is dipped into the bacterial suspension. This in turn is drawn into the tube exactly to the mark. By pressure on the rubber teat, the two tiny columns are forced out upon a clean microscope slide; they are thoroughly mixed by alternately drawing them up into the tube and forcing them out. A drop of the mixture is then placed upon another clean slide and spread out in a thin layer by drawing the edge of another slide over it. The slide is fixed with a saturated solution of mercury bichlorid and stained with methylene blue and eosin, or one of the other blood stains —Wright, Leishman, Giemsa. Under the microscope the red corpuscles and bacteria in several fields are separately counted. Since there are equal parts of bacterial suspension and blood, and since the normal number of corpuscles per cmm. of blood is 5,000,000, it is a simple problem in proportion to figure out the number of bacteria per cc. in the suspension.

In diluting the bacterial suspension, it is convenient to adjust the numbers so that each cc. of the finished product will contain 300,000,000 staphylococci, if these organisms are present, and 50,000,000 each of the other bacteria found. The vaccine is preserved by the addition of 0.25 per cent. tricresol.

After the preparation of the vaccine, we must be certain by tests that, first, it is sterile, and second, that it contains no products harmful to the animal body.

The first test is made by placing a few drops in each of one or more fermentation tubes containing freshly sterilized 2 per cent. dextrose bouillon. After these tubes are incubated seventy-two hours, they are examined for growth; if no growth is found, the vaccine may be considered sterile, although the tubes should not be discarded for at least ten days.

The second test consists of injecting subcutaneously into a guinea-pig from two to five cc. of the vaccine. If the guinea-pig is living and well at the end of seven days, the vaccine may be released for use, although the animal should be kept under observation up to the fourteenth day.

I am well aware that many laboratories turn out autogenous vaccines within from forty-eight to seventy-two hours. It is impossible that products prepared and delivered in this length of time can have been properly tested. A curtailing of the check-test period is only justified in extremely urgent cases.

When treatment with the vaccine is commenced, it is suggested that the first doses be small—1/5 to 1/4 cc., and given at intervals of from five to seven days, and that the doses be increased or not according to the indications. The effects of pyorrhea and of its treatment with vaccines are far-reaching and concern the patient's entire economy. For this reason it is felt that vaccine treatment should

be instituted only in collaboration with the patient's physician.

The so-called "short method" of preparing autogenous vaccines must be condemned without qualification. The material collected is often spread carelessly upon the surface of a culture medium, frequently plain agar; it is incubated over night and the growth suspended in saline solution, possibly counted and diluted according to the count, or merely to a doubtful turbidity index. It is heated to about 60° C., perhaps in a tube which has not been sealed and completely immersed, and receives tricresol either before or after the heating. Sometimes check tests are made for sterility, more often they are not. In this connection it must be understood that substances intended for subcutaneous injection must be prepared with infinitely more care than those intended for oral administration.

THEORETICAL CONSIDERATIONS.

For an intelligent comprehension of the scientific basis underlying the use of bacterial vaccines, it will be necessary to review briefly the development of our present ideas concerning immunity.

Metchnikoff, in his study of the white blood corpuscles or leucocytes, observed that they had the power of ingesting and destroying bacteria and other foreign bodies. Ehrlich at the same time, in his investigation of the blood serum, found that in the course of infection it took on new chemical properties, which were specific for the bacteria concerned; these newly formed substances he called antibodies, because they were antagonistic to the bacteria.

Further light was thrown on the subject by Sir Almroth Wright, who noted that the leucocytes ingest and destroy bacteria only after the latter have been acted upon by certain antibodies—which he called opsonins—in the blood serum. Wright thus brought into harmony the French and German schools of immunity by showing that both the biological and chemical elements of the blood are necessary for the removal of invading bacteria. The nomenclature, however, of all these theories is so intricate that it can be thoroughly understood only by those who have made a lifelong study of the subject, whereas all the principles essential for a clear understanding of immunity can be found in the more simple language of Prof. V. C. Vaughan.

Vaughan had for several years been studying the chemistry of the bacterial cell, when Rosenau and Anderson called attention to a phenomenon which, at the time, seemed to upset our ideas of immunity. Richet, a French observer, had already noted the same phenomenon, and believing that he had found a condition which was the opposite of prophylaxis, he called it *anaphylaxis*. In his investigations of certain poisons derived from sea-urchins, he found that an injection of this poison into a dog, instead of rendering the animal immune to a second dose, actually made him more susceptible.

Rosenau and Anderson observed that guinea-pigs injected a second time with horse serum after a lapse of at least fourteen days were killed by this ordinarily harmless albuminous fluid. The pioneer investigations of these American scientists have laid the foundations of our present knowledge of anaphylaxis.

Anaphylaxis concerns the effect of proteins or albuminous substances upon animals; it concerns all proteins, whether they are poisonous in themselves or not; for instance, egg-white and normal horse serum act precisely as the proteins of the plague bacillus or of the typhoid bacillus. And, furthermore, the proteins of dead bacteria act practically in the same way as the proteins of living bacteria. It must be remembered, however, that anaphylactic symptoms can be produced only by proteins foreign to the animal: that is, anaphylaxis cannot occur in a guinea-pig from the repeated injection of guinea-pig serum, nor can the symptoms be produced in a horse by the injection of horse serum.

If we inject a guinea-pig parenterally —that is, by any route except by the gastro-intestinal canal—it does not appear to suffer the slightest inconvenience.

If, however, we inject this animal, two or more weeks later, with the same protein, it will die within one or two minutes and with very definite symptoms accompanying death. This is one manifestation of anaphylaxis.

For an explanation of this phenomenon, it was necessary to go back to the above-mentioned work of Prof. Victor C. Vaughan upon the chemistry of the protein molecule. Vaughan had shown that a protein, treated chemically according to his method, is split into two parts—the one poisonous, the other non-poisonous. The poisonous part obtained from all proteins is the same; whether it results from the splitting of egg-white or from the splitting of typhoid bacilli, the symptoms leading to death in the guinea-pig are identical. The poisonous part, then, is a poison and has no other function or effect; one dose has no bearing upon the effect of a subsequent dose, no hypersusceptibility is produced, and no tolerance, even by repeated administration.

The non-poisonous part, on the other hand, is specific in its action. The non-poisonous part of typhoid bacillus protein will immunize an animal against typhoid infection, but not against infection with colon bacilli; the non-poisonous part of horse serum will sensitize a guinea-pig to horse serum, but not to goat or sheep serum.

Vaughan has promulgated the theory that a similar splitting action occurs in the tissues, and that instead of being the opposite of immunity, anaphylaxis is merely one of its manifestations, the only difference being the amount of the poisonous part liberated within a given length of time.

When foreign proteins are injected into the tissues of an animal, the body cells at once set to work to remove this protein. They prepare a ferment capable of splitting the protein molecule, which, possibly because of its size, is not diffusible, into smaller fractions able to pass into the circulatory system and be thence eliminated. These fractions of protein molecule, similar to those obtained by Vaughan chemically, are: a poisonous part which, after the first injection, is liberated slowly and is therefore harmless in its effect, and a non-poisonous specific part which stimulates the body cells to produce a specific, ferment-like substance. About two weeks after injection the protein has been entirely removed from the tissues, the poisonous part has been eliminated so gradually that no symptoms have resulted, and the non-poisonous part has stimulated the tissues to generate a large amount of specific protein-splitting ferment.

The guinea-pig, then, at the end of two weeks after the first injection of, let us say, horse serum, contains in his tissues no trace of horse serum; but he does have within his body a large quantity of protein-splitting, ferment which may remain in the tissues for a long time; and, even if it disappears, the power to generate this ferment upon demand may remain permanently. If we now inject into this guinea-pig a second dose of horse serum, the proteins contained therein are at once attacked by the specific ferment; digestion occurs almost immediately, resulting in the liberation of a large quantity of the poisonous part of the protein molecule; the animal is overwhelmed by it, and dies usually in less than five minutes. A dose sufficiently large to cause death depends upon the method of injection; if injected into the circulation or into the brain, 1/20 cc. is sufficient; if injected subcutaneously, however, at least 5 cc. is usually necessary.

As to the bearing of this phenomenon upon infectious disease, Vaughan has used typhoid fever as a typical illustration. Infection results from the entrance of a few typhoid bacilli into the tissues under circumstances which permit their growth and multiplication. There is normally present in the body a small amount of a non-specific protein-splitting ferment which attacks the typhoid bacilli, liberating the non-poisonous part, which in turn begins to stimulate the tissues to the production of a specific anti-typhoid ferment. We know that in guinea-pigs it takes from eight to fourteen days

to produce enough ferment to cause serious symptoms of intoxication upon the injection of a second dose of the protein. This period corresponds exactly to the incubation period in typhoid fever. It is during this time that the typhoid protein-splitting ferment is produced in increasing quantities, while the typhoid bacilli are rapidly growing in numbers. The ferment sets free the poisonous part in gradually increasing quantities with the final appearance and progressive increase of fever and the other symptoms of the disease. This process continues up to the point where the number of typhoid bacilli destroyed equals the number reproduced in the lesion. This balance is maintained for a time, until the number of bacilli destroyed exceeds those reproduced.

A patient recovered from typhoid fever or a person who has been injected with typhoid vaccine has in his tissues a large amount of typhoid protein-splitting ferment, so that, when typhoid bacilli later gain entrance to his tissues, they are at once attacked and destroyed before they have a chance to develop. Obviously there is no intoxication because the amount of typhoid proteins is infinitesimal compared to the amount necessary to result in anaphylactic shock.

A demonstration of the presence of specific ferments in the blood as a result of foreign proteins in the tissues is afforded by the Abderhalden test. Abderhalden thought that if foreign proteins were removed from the tissues by a splitting of the protein molecule, and if the blood contained ferments with this power, their presence could be demonstrated by test-tube experiments.

The research was fruitful of positive results, and an application of it is now recognized as being of great value in the diagnosis of pregnancy, even during the early weeks.

It is now easy to understand the action of bacterial vaccine in pyorrhea alveolaris. At the seat of disease are certain bacteria which are merely living proteins. In order to remove them. we inject identical proteins into healthy tissues. The specific ferment content of the blood is thereby increased, the bacteria are dissolved, and thus removed. It is therefore obvious that the requisites to success in vaccine therapy are, first, that the vaccine injected must contain bacterial proteins identical in kind with those causing the infection; second, that the ferment produced locally must come in contact with the infecting bacteria. For one with proper training, it is not difficult to determine the kind of bacteria causing an infection, nor is it difficult to either obtain a stock vaccine representing these bacteria or to prepare an autogenous vaccine identical with them; and it is a very simple matter to inject these bacterial suspensions beneath the skin of the patient. If the patient is not in the last stages of disease, there is not one chance in many thousands that his tissues will fail to produce the proper antibodies or ferments.

Unfortunately, the mere presence of specific ferments in the tissues is not tantamount to destruction of bacteria at the focus of infection. Bringing these ferments in contact with the infecting bacteria is the most difficult part of the treatment. Bacteria in pyorrhea can thrive locally, because serumal and salivary calculi and other foreign bodies present weaken the resistance of the tissues, and also because a barrier, resulting from the inflammation, prevents the antibodies from coming in contact with the bacteria. If this were not the case there would be no infection, because the blood contains normally antibodies which are able to destroy bacteria. In proof of this, it is sufficient to call attention to the fact that primary blood infection almost never occurs. With bacterial vaccines, we merely increase the concentration of antibacterial ferments in the blood, so that a greater amount will reach the bacteria in question.

It may be easier to understand the effect of pyorrhea alveolaris upon the body generally if we think of the disease from the standpoint of physical chemistry. Dialysis plays an important part in this connection. A dialyzing membrane consists either of animal tissue or of paper treated in such a way that its density corresponds to that of an animal membrane. Crystalloids—that is, sub-

stances which will osmose—will pass through the membrane, because their molecules are very small and separated from one another. The substances which do *not* osmose are known as *colloids;* these include the proteins. In the digestive process, proteins pass through several stages, finally becoming peptones and then amino-acids. The protein molecules, which are relatively very large, are split up until, in the peptone stage, they have become small enough to pass through the dialyzer.

Turning now to the pyorrhea pocket, we see that it is very similar to a dialyzer. It is lined with inflammatory tissue which is sometimes called a pyogenic membrane. This membrane is composed chiefly of granulation tissue, and is but poorly supplied with bloodvessels. The bacteria are thus able to protect themselves against the antibacterial powers of the blood. The small amount of antibacterial ferment which may penetrate to them is not sufficient to eradicate the bacteria. It merely helps to destroy those with which it comes in contact, splitting them into the poisonous and non-poisonous parts. The presence of these ferments is not entirely necessary, since bacteria have the power of digesting themselves under certain conditions. This is called autolysis. The poisonous part, consisting of very small molecules, readily penetrates the membrane and passes into the circulation, causing the constitutional ailments so often accompanying pyorrhea. The non-poisonous part, however, is composed of molecules so large that it cannot penetrate the membrane until it is further digested and broken up into inactive substances, possibly amino-acids.

This theory answers the objection formerly raised against the use of bacterial vaccines. It was thought that, since bacteria are already present in the tissues, by putting in more, even though dead ones, one merely adds fuel to the fire. But we see, according to the above hypothesis, that the conditions surrounding bacteria injected into healthy tissues are entirely different. Any local reaction, resulting from liberation of the poisonous part, soon disappears, because the poisonous part is quickly absorbed, and the non-poisonous part is left to exercise its function of stimulating the tissues to form specific ferments. This explains, furthermore, the benefit of local massage by careful brushing of the teeth. The pressure possibly squeezes the non-poisonous part through the pyogenic membrane so that it can pass into normal tissues and there exert its function. It seems scarcely necessary to add that foreign bodies, such as calculi and tartar, must be removed from the root surfaces; their mechanical irritation results in the production of inflammatory tissue, which offers far more favorable conditions than healthy tissue for the growth of bacteria.

SUMMARY.

(1) The treatment of pyorrhea alveolaris with bacterial vaccines depends upon the use of suspensions representing the bacteria responsible for the infection.

(2) In preparing the vaccine, one should not discard any germ found in a carefully collected specimen.

(3) Bacterial suspensions injected beneath the healthy skin stimulate the tissues to the formation of specific ferments.

(4) The ferments thus formed are efficient only when they come into direct contact with the infecting bacteria.

(5) In pyorrhea alveolaris, this is accomplished by proper local treatment.

(6) Proper brushing of the teeth and gums acts as a massage, bringing the blood to the infective elements and squeezing out into the tissues the non-poisonous part of the bacterial protein molecules.

(7) The disease tends to become chronic, and poisons the patient, because the small molecules of the poisonous part diffuse readily, while the larger molecules of the non-poisonous part do not dialyze into tissues where they can stimulate the production of antibacterial ferments.

(8) It is clear, then, that the use of bacterial vaccines as an adjuvant in the treatment of pyorrhea alveolaris is rational, but that it can accomplish little if unassisted by local means.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE DENTIST'S EYES.

By THOMAS G. ATKINSON, M.D., L.R.C.P.Lond., Chicago, Ill.

DID you ever engage in the old schoolboy trick of seeing who could hold out his arm the longest? Even if you won the contest, you did not make much of a time record; a few minutes, at the most, was all your muscles would stand of that constant, unopposed contraction.

Yet that is precisely the kind of thing to which you are subjecting your eye muscles all the time—especially the ciliary muscle, that little circular muscle which surrounds the crystalline lens in the eye and by its contraction changes the curvature of the lens, enabling you to see near objects clearly, and which is therefore called the muscle of accommodation.

There is no class of men who subject their eyes to greater strain than dentists. The nature and necessities of their work impose upon them three conditions of vision:

(1) They are obliged to work all the time at near point.

(2) They must have a detailed view of the small field they work on.

(3) They are forced to maintain steady vision, at one range, for long uninterrupted periods.

These three conditions involve a very trying strain on both the muscles and the retina of the eye. Dentists stand, for hours at a stretch, with their vision fixed steadily on a very small field, close to their eyes—almost at the end of their noses—doing the finest kind of mechanical work on the minute structures of the teeth. This means that—

(1) The external muscles of the eye, which direct it toward the object, are in constant, steady contraction.

(2) The ciliary muscle, which gives correct focus to the image, is in even more concentrated and persistent contraction.

(3) The retina, which receives the light upon its outspread nerve-endings, is under continued stimulation with a monotonous, nagging detail.

The wonder is that the eye stands for it at all. The arm would not, as we have seen. Fortunately, the eye muscles are better trained than those of the arm, and will stand a lot more steady effort. Indeed, a pair of quite normal eyes, in a healthy individual, can hardly be overworked as long as they are used properly.

But suppose the eyes are not normal. I do not mean diseased, but suppose their refraction is not normal. Then the constant muscular and nervous strain becomes a very serious matter, just as is a long-distance footrace to a man with a sprained leg. Then the eye muscle is overworked, and—what is perhaps worse—the adaptation between the various muscles and nerves, which normally work in perfect accord, is disturbed. The person is obliged to put additional power into this muscle or not quite so much into that, and so all are working under some kind of handicap.

Even so, the eyes will still manage to make good when they are not used much for close work. And even when they are so used they will often overcome the handicap for quite a long time; then they usually give out quite suddenly and utterly. Under the trying use to which dentists subject them, if their refraction is not normal, they *always* give out sooner or later.

It is of the utmost importance that the dentist satisfy himself that his refraction is normal; and if it be not, then it is imperative that he have his refraction properly corrected. Dentists

are constantly advising people to make sure that their teeth are sound, especially if they live under conditions which are trying to the teeth. By the same token, dentists ought to make certain that their refraction is normal, in view of the trying use to which they are subjecting their eyes, and considering the importance of good vision as a part of their stock-in-trade.

There are three common errors of refraction, each of which gives its own peculiar train of troubles.

HYPEROPIA.

This is the commonest error. The hyperopic eye is too short for its refractive power, so that light rays are focused farther back than normal. This means that the hyperope is under two handicaps:

(*a*) He has to contract his ciliary muscle more than normally to see near objects clearly, and this gradually induces permanent hypertrophy and spasm.

(*b*) He does *not* have to converge any more than the normal person, so that the adaptation between convergence and accommodation is upset.

The result is a congestion of the eye and a nervous disturbance. The eyes become inflamed and bloodshot, the patient suffers with brow headaches and nervous irritation, and finally the overworked eye muscles give out and vision is blurred.

MYOPIA.

The myopic eye is too long for its refractive power, so that the image is focused too far forward. This makes less than normal accommodation necessary for near vision. It might seem, at first blush, that myopia should not be a serious hindrance to near vision, but rather a help to it. And, in fact, it is not of itself as great a handicap to the dentist in his work as hyperopia. Its chief disadvantage lies in distant vision.

We must remember, however, that myopia involves just the same break in the relation between convergence and accommodation as too much muscular effort; and, furthermore, there is always a tendency on the part of the myopic eye to grow more and more myopic, and, in fact, to become diseased, if it is not corrected.

Myopia produces no headaches or congestion, as a rule, but causes nervous disturbances, and ought to be corrected.

It should be observed that both hyperopia and myopia may be overcome in near work for a long time, and thus remain unnoticed. The mere fact that one can see his work is no surety that these errors do not exist. Where they do exist, and are being overcome, it is at a serious cost of nerve and muscle, which will sooner or later have to be reckoned with.

ASTIGMATISM.

The astigmatic eye is the most troublesome of all, especially when it is also hyperopic or myopic (compound astigmatism). It is, as its name implies, an eye the curvature of which is not the same in all meridians, so that rays cannot be focused at a point. This condition really has nothing to do with the eye muscles or their function, but lies in the shape of the cornea. However, it gives a very blurred image, which the ciliary and external muscles (especially the latter) are continually striving to remedy by twisting the axes of the eye. Hence the principal symptoms of this disturbance, outside of poor vision and nervousness, are a headache around the temples and back of the head, and dizziness.

Astigmatism affects far and near vision alike, is the least able to be compensated by the eye, and is usually associated with other errors. Happily, it is susceptible of the most accurate correction of all the errors of refraction.

I repeat, the dentist, in view of the steady, exacting strain which his work imposes on the eye, and the imperative part played by good vision in that work, cannot afford to take chances on the handicap of an error of refraction. It ought to be a routine part of his preparation for the practice of his profes-

sion to undergo a thorough and competent examination as to his eye refraction; and if any error exists, however slight, it should be carefully corrected and his eyes rendered normal before he sets out upon his life-work.

CARE OF THE EYES.

Not only does the dentist recommend his patients to undergo periodic examinations of their teeth to make sure that they are sound, but he enjoins upon them a constant care of the teeth and gums to keep them in good condition. So, also, when the eyes are normal, or after they have been rendered normal by proper lens correction, there still remains the necessity of watchful care of the eyes under the trying exigencies of dental work. For even normal eyes will give out if they are abused, or subjected to hurtful conditions of usage. I therefore append a few brief, simple rules for the care and hygiene of the eyes, which I hope every dentist will keep in mind constantly and make a part of his daily habits:

The eyes must be protected from dust. When riding in an automobile, goggles should always be worn. In any case, it is a good plan to wash the eyes thoroughly every evening with copious flushings of warm boric acid or normal salt solution.

Exposure to sudden extremes of temperature and to high winds is to be avoided. When obliged to face sudden changes of temperature, the eyes should be closed for a few moments until the conjunctiva gradually becomes cooled or warmed, as the case may be.

Infection, to which the membrane of the eye is exceedingly sensitive, must be scrupulously guarded against. Everything which touches the eye—including the hand—must be perfectly clean and sterile.

The dentist should have his work on a level with his eyes, as much as possible, so as not to pore over it with head bent downward. Such a posture induces congestion of the eyeball. This applies especially to myopic persons, for by this posture myopia is often made progressive and malignant.

Work should be done in daylight whenever possible. When it is not possible, daylight should be reproduced as nearly as practicable with indirect, well-diffused artificial light.

Next to daylight, electric light is most desirable. It gives an almost white light; it burns with comparative steadiness, it yields the most light for the least bulk; its intensity is most easily regulated; it does not vitiate the air; and it does not affect the temperature to any appreciable extent.

Good illumination is imperative. The inadequate intensity of an image made upon the retina by insufficient light requires that the image be held there for a proportionately greater length of time, and thus musculature and the nervous system both suffer.

Too much light, however, is almost, if not quite, as bad as too little. Teasing of the nerve-ends of the retina quickly inflames and exhausts them, and retinitis or retinal neurasthenia ensues.

When working on glittering materials, such as crowns and plates, it is well to protect the retina by wearing slightly tinted glasses.

A strong light should not be faced. The dentist's work unfortunately obliges him to stand with the light falling more or less directly on his eyes. This is offset by wearing an eye-shade.

The eyes must be given frequent short rests by removing them from the work and relaxing their accommodation and convergence for a few moments by looking into the distance.

THE DUNFERMLINE SCHOOL DENTAL CLINIC OF THE CARNEGIE DUNFERMLINE TRUST,

From Its Foundation in September 1910 to March 1914.

By L. STORROW SHENNAN, D.D.S.Pa., L.D.S.R.C.S.Ed., Edinburgh, Scotland.

THE Dental Clinic was inaugurated in September 1910, and has been a great success from the first. Two apartments were fitted up in the large corridor of the Old Baths, but in the near future the clinic will have its quarters in a large new building which is also to house the Medical Clinic and the College of Hygiene and Physical Training, Dunfermline being now the center for such training in Scotland.

No expense was spared in fitting the surgery with the most modern appliances, so as to facilitate the work in every way. The second department was used as a waiting-room. At first the clinic was open for nine hours per week, but in April 1911 the time was increased to twelve hours per week, an arrangement which has continued up to the present time.

For some time one whole day of six hours was tried, and another half-day of three hours; but more work has been done under the later arrangement of four hours on three days per week, and the resulting exhaustion to the school dentist has not been so great. There is no doubt that the work is more exhausting by far than that of ordinary private practice.

At first two trained nurses (one for each half of the whole day) were assigned to the clinic; later, one trained nurse and a secretary; later still, one trained nurse and one female clinic assistant. The presence of the nurse gives the children confidence, as she gets to know them at the school medical inspection and the medical clinic. The female assistant also gives help in the medical clinic, so that she too gets to know the children.

At first the secretary (and now the nurse) made all appointments, entered operations, made arrangements for inspection at the various schools, and sent lists with the names of pupils expected each day to the headmasters and headmistresses. This method, however, involved so much clinical work that now attendance cards are given out, showing the name of child, school and class, home address, day and hour of visit, time of leaving school to keep appointment, and time of arriving at and of leaving the clinic. This has been found a sufficient link between the school and clinics for casual cases, as the children have to show these cards to their teachers. In the case of the treatment of children who have been examined in the respective infant departments, a full list of those whose parents have agreed to allow treatment is supplied to the headmistress, and the children are sent up in groups of six each half-hour or eight each hour for two hours each clinic morning—this being the time set aside as far as possible for these children. Sometimes the children are accompanied by their parents.

Systematic inspections are restricted to children of ages from five to ten in the primary departments, the older children in these classes being usually more backward mentally, hence their presence at a more advanced age.

Notes of treatment to be adopted were at first entered in British Dental Association charts, but now a card index system is used, which is much more convenient.

Notification circulars are sent to parents or guardians to intimate the results of the examinations, and they are requested to return them signed if treatment for their children is desired.

Specimens are here shown of the cards and notices which are employed in connection with the work.

There is no lack of material, and the children are extremely plucky. On an average most attendances are given by children of from six to nine years of age.

Many children—of ages ranging from four to fifteen years—come of their own

[*Notification Circular.*]

CARNEGIE DUNFERMLINE TRUST.

SCHOOL DENTAL CLINIC.

DEFECTIVE TEETH.

In the interests of a child's future health decayed teeth should be attended to at the earliest possible date by a properly qualified dentist.

The first double teeth of the second set begin to come between the ages of 5½-7 years. They cannot be replaced and ought to be kept through life. These teeth are extremely important, as the child must do nearly all its chewing with these until it reaches the age of 12 years. Decaying teeth of the first set are very likely to spread decay to and injure the second or permanent set.

The health and future prospects of the child may be seriously affected by delay; a sound set of teeth is one of the signs of physical fitness, and the whole nutrition of the body depends directly or indirectly on the condition of the teeth.

Decay of the teeth is in a great measure the result of the action of destructive microbes in the mouth, and the matter from them or from "gumboils" disorders the stomach and makes the breath foul.

Headaches, neuralgia and swollen glands are often caused by decaying teeth. Indigestion, "bloodlessness" (anæmia), blood-poisoning, and a host of other evils are caused by decaying teeth, and they form channels for the development of fevers, diphtheria, consumption, and other diseases.

Teeth should always be well brushed with a tooth-brush night and morning, with soap and water, or with some powdered chalk. School children may obtain a tooth-brush or a box of tooth powder at the Clinic for 1d.

From .

The School Dental Clinic,
BATH STREET,
DUNFERMLINE.

. . . . . *191*

To
The Parents or Guardians of
. . . . . .

This child's teeth have been found to need attention. You are strongly recommended to have the necessary treatment carried out at once; or, if you consent, the child will be treated by the School Dentist.

Please sign the printed form at the bottom of this sheet, and return to the Head Teacher.

I agree to have my child's teeth attended to by the School Dentist.

Signed . . . . . .

DUNFERMLINE, ... 191

Moreover, these forms are useful because they give the authority of the guardian to do what one thinks necessary. If an anesthetic is required, a special form of circular is sent out.

CARNEGIE DUNFERMLINE TRUST.

SCHOOL DENTAL CLINIC.

BATH STREET,

DUNFERMLINE, ... 191

Sir,

I have finished putting your ..... teeth in order by filling those savable, but to put the mouth in a satisfactory state there still remain some teeth or roots which require removal.

To prevent pain and shock to the child I propose to have gas administered for their removal. If you consent to this being done, kindly fill up and sign the attached form and return it to me as soon as possible, as special arrangements are necessary.

Defective teeth and painful gums mean incomplete mastication and consequent digestive troubles, which lead to serious complications later in life.

Yours faithfully,

.....

School Dentist.

Address, ...

Date, ...

TO THE SCHOOL DENTIST, SCHOOL CLINIC,
BATH STREET, DUNFERMLINE.

Dear Sir,

I consent to the administration of gas to my child, ...

for the removal of decayed teeth.

Signature of Parent or Guardian. .....

[*Clinic Attendance Card.*]

The Carnegie Dunfermline Trust.

SCHOOL DENTAL CLINIC,

Bath Street, Dunfermline.

Name.....*Age*.....

Address .....

School.....*Class*.....

To come on

.....**191** **at**.....**o'clock**

..... ,, ,, ... ,,

..... ,, ,, ... ,,

..... ,, ,, ... ,,

..... ,, ,, ... ,,

..... ,, ,, ... ,,

PLEASE BRING THIS CARD AT EACH VISIT.

Record of Attendances at the School Clinic.

This Card should be retained by the Head Teacher as a record of the child's attendance at the Clinic during school hours. The Card should be handed to the child when leaving School for the Clinic, and the child should hand it back to the teacher on returning to School.

Date.	Left School.	Arrived Clinic.	Left Clinic.	Nurse's Initials.

[*Case Record.*]

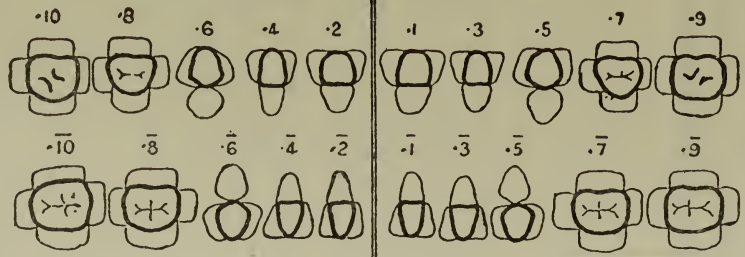
No...... **DUNFERMLINE SCHOOL CLINIC.** **BOYS.**

Name: *Address:* *Age:*

Date Inspected: *School:* *Dep:* *Class:*

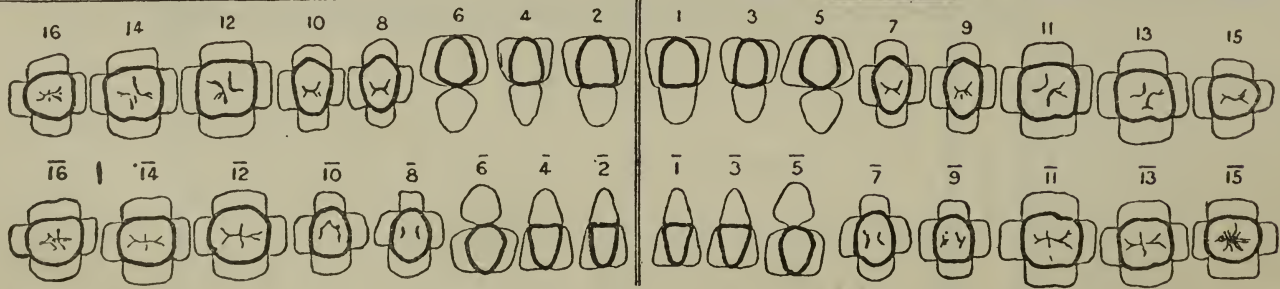
TEMPORARY TEETH.	No. of
Carious Savable	.....
Carious, but not requiring filling	.....
Prematurely lost	.....
Requiring Extraction	.....
PERMANENT TEETH.	
Carious Savable	.....
Carious Unsavable	.....
Already Extracted	.....
Requiring Extraction	.....

RIGHT. LEFT



SYMBOLS

Tooth Lost (temporary) —
Tooth not Erupted ... |
Tooth Extracted ... X
Tooth requiring Xt. ... /
Tooth with Fistula ... ⊙
Tooth Erupting ... ... Λ
Natural Arrest of Caries L



STATE OF TEETH.
Clean. Fairly Clean. Dirty.
STATE OF GUMS.
Tartar—Little. Much.
Toothbrush Used. Not Used. Has None.
Fistulae, No. of

Teeth Irregular—Upper Lower
Sound Dentition—
Temporary. Transitional. Permanent.
Roots of Teeth—
Temporary. Permanent.
Supernumerary Teeth, No. of

Hare Lip—Cleft Palate. Hard. Soft.
Mouth breather— Much Caries.
Little Caries. Enlarged Tonsils.
Geminated Teeth, No. of
Natural Arrest of Caries

[*Reverse.*]

TEMPORARY TEETH.	No.	PERMANENT TEETH.	
Sound	.....	*Sound*	.....
Decayed	.....	*Decayed*	.....
Dressings	.....	*Dressings*	.....
Fillings	.....	*Fillings*	.....
Extractions	.....	*Extractions*	.....

Date	Operation	Date	Operation

NOTES.

accord. In these cases the same cards are used, but no notification is sent to the parents, and appointments are made as vacancies occur. About one and one-half hours of the clinic morning are devoted to these casual cases, who have either come of their own accord or have been sent by teachers or parents.

Tooth-brushes and powder are supplied at a small charge.

Session 1910-11.

In September 1910, as the appliances were not all sufficiently forward to admit of beginning work, I examined the primary department of two schools. Unfortunately, an analysis of these was not made suitable for comparison with those given for the later years. It was intended to treat these pupils systematically, but this intention could not be carried out, as so many children came voluntarily from all the schools.

Sufficient apparatus being in place in

Details of Treatment.

(1910.)	Boys.	Girls.	Visits to clinic.	Dressings and fillings.	Extractions.
October	. .	. .	82	80	34
November	. .	. .	165	135	69
December	. .	. .	163	126	87
	58	155			
Totals	*213*		410	341	190

(Extractions include 4 second dentition teeth and 1 supernumerary.)

Ages of the Children.

Girls.					Boys.					
Age.	Oct.	Nov.	Dec.	Total.	Age.	Oct.	Nov.	Dec.	Total.	Grand total.
Years.					Years.					
4	. .	. .	. .	. .	4	. .	2	. .	2	2
5	. .	1	1	2	5	1	2	2	5	7
6	1	3	6	10	6	. .	4	2	6	16
7	3	3	7	13	7	2	1	1	4	17
8	6	14	16	36	8	6	1	2	9	45
9	3	8	9	20	9	2	4	4	10	30
10	. .	4	9	13	10	. .	4	2	6	19
11	1	10	15	26	11	1	2	3	6	32
12	. .	3	6	9	12	. .	2	2	4	13
13	1	4	6	11	13	1	. .	. .	1	12
14	. .	1	1	2	14	1	. .	. .	1	3
Not stated.	2	6	5	13	Not stated.	3	1	. .	4	17
	17	57	81	155		17	23	18	58	213

(Girls, 155; boys, 58. Total, 213.)

October, 213 children, of the ages from 4 to 14, received treatment during the months of October, November, and December.

The attendance being still most encouraging, I undertook regulation work in addition.

During this time I had the assistance of a lady secretary. She proved of great value in making arrangements and keeping records of work done.

Work went on smoothly in January, February, and March, and between April and June I inspected the primary department of another school, comprising 282 pupils, 150 boys and 132 girls of ages 4 to 10. Here 271 were found to have defective teeth, as follows:

	Boys.	Girls.	Totals.
With sound teeth	6	5	11
" 1 to 3 carious teeth	56	28	84
" 4 " 6 " "	53	47	100
" 7 and more carious teeth	35	52	87
Totals	150	132	282

Work Done at Clinic, 1911—January to June.

(1911.)	Individual patients.		Attendances.		Dressings and fillings.		Extractions.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
January	. .	. .	50	116	22	85	29	54
February	. .	. .	61	159	51	126	38	38
March	. .	. .	74	207	44	142	47	72
Totals	. . *313*	. .	185 *667*	482	117 *470*	353	114 *278*	164
April	. .	. .	33	97	20	73	9	33
May	. .	. .	77	179	69	155	25	43
June	. .	. .	69	127	59	93	11	43
Totals	. . *362*	. .	179 *582*	403	148 *469*	321	45 *164*	119

(January, February, March: Extractions mainly of deciduous teeth. April, May, June: Extractions include 3 permanent teeth.)

Session 1911-12.

August to December, 1911. In this period five Wednesdays were devoted to examination of the primary department of another school, comprising 252 children—115 boys; 137 girls.

Only 21, or 8 per cent., had sound teeth—9 boys and 12 girls.

The table (*A*) shows the number of defective teeth in these children at the different ages.

Six impressions were taken for regulation or to show necessity for artificial substitutes, all for girls of ages 10 to 13.

Eight permanent teeth were extracted.

Four special attendances were for extractions under a general anesthetic

A DEFECTIVE TEETH AT THE DIFFERENT AGES—(INFANT DEPARTMENT).

AGE.	Sound dentition.		Number of carious teeth.						Totals.	
			1 to 4.		5 to 7.		Over 7.		Boys.	Girls.
4 yrs.—Boys			2		2		2		6	
" —Girls										
5 yrs.—Boys	4		10		6		4		24	
" —Girls		4		7		5		7		23
6 yrs.—Boys	5		13		8		11		37	
" —Girls		2		13		7		10		32
7 yrs.—Boys			9		9		11		29	
" —Girls		3		10		17		16		46
8 yrs.—Boys			6		2		4		12	
" —Girls				7		8		8		23
9 yrs.—Boys			1		3		2		6	
" —Girls		3		2		3		3		11
10 yrs.—Boys							1		1	
" —Girls						1		1		2
Totals	9	12	41	39	30	41	35	45	115	137
	21		*80*		*71*		*80*		*252*	

Summary.

	Boys.	Girls.	Totals.
With sound teeth	9	12	21
" 1 to 4 carious teeth	41	39	80
" 5 " 7 " "	30	41	71
" over 7 " "	35	45	80
Totals	115	137	252

B DEFECTIVE TEETH AT THE DIFFERENT AGES—(INFANT DEPARTMENT).

AGE.	Sound dentition.		Number of carious teeth.						Totals.	
			1 to 4.		5 to 7.		Over 7.		Boys.	Girls.
4 yrs.—Boys	1		1						2	
" —Girls				1						1
5 yrs.—Boys	1		4		6		4		15	
" —Girls				3		2		4		9
6 yrs.—Boys	2		7		4		4		17	
" —Girls		1		2		2		2		7
7 yrs.—Boys	4		5		4		5		18	
" —Girls		1		6		6		5		18
8 yrs.—Boys			6		4		6		16	
" —Girls				4		8		1		13
9 yrs.—Boys			2		1		1		4	
" —Girls				3				1		4
Totals	8	2	25	19	19	18	20	13	72	52
	10		*44*		*37*		*33*		*124*	

Summary.

	Boys.	Girls.	Totals.
With sound teeth	8	2	10
" 1 to 4 carious teeth	25	19	44
" 5 " 7 " "	19	18	37
" over 7 " "	20	13	33
Totals	72	52	124

(N_2O and O). I am of the opinion that the anticipation of this is more of an ordeal than ordinary extractions which are done at once and before the children can think long about what is going to happen.

January to June, 1912. In this period another school was examined, the results being shown in the table (*B*), the number being 124, *i.e.* 72 boys and 52 girls. Of these only 10 (8 boys and 2 girls) did not require treatment; 85 children received appointments, but only 58 availed themselves of the opportunity. This may have been due to the trouble caused by a strike—as the lists sent to the teachers required revision so often—more than to the parents.

Work Done in Session 1911–12.

(1911.)	Individual patients.		Attendances.		Dressings and fillings.		Extractions.		Impressions.		Regulations.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
July	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
August	. .	. .	81	109	47	93	40	33	. .	. .	. .	. .
September	. .	. .	198	341	130	230	74	131	. .	. .	. .	. .
Totals	. .	. .	279	450	177	323	114	164	. .	. .	. .	
	. .	. .	*729*		*500*		*278*		. .	. .	. .	. .
October	. .	. .	134	171	69	117	84	62	. .	. .	. .	. .
November	. .	. .	177	255	112	176	82	91	. .	. .	. .	. .
December	.	. .	136	197	88	132	81	84	6	. .	. .	. .
Totals	693		447	623	269	425	247	237	6	. .	. .	. .
	. .	. .	*1070*		*694*		*484*		. .	. .	. .	. .
(1912.)												
January	. .	. .	120	204	61	114	72	103	. .	. .	. .	. .
February	. .	. .	155	218	94	169	78	51	. .	. .	. .	. .
March	.	. .	192	184	132	143	73	42	. .	. .	. .	. .
Totals	. .	. .	467	606	287	426	223	196	. .	. .	. .	. .
	. .	. .	*1073*		*713*		*419*		. .	. .	. .	. .
April	. .	. .	118	134	78	102	38	42	. .	. .	. .	. .
May	. .	. .	174	179	99	126	69	43	. .	. .	. .	. .
June	. .	. .	162	138	96	93	56	65	41	. .	7	. .
Totals	318		454	451	273	321	163	150	41	. .	7	. .
	. .	. .	*905*		*594*		*313*		. .	. .	. .	. .

(Out of a total of 1494 extractions, 65 only were permanent teeth.)

Session 1912-13.

During the last three months of 1912 I was absent through illness, but my brother, Alexander Shennan, M.A., L.D.S.Ed., took my place for the time.

The Commercial School infant department was examined—five days' time, of the children had lost their notices, and duplicate notices were made out.

The number examined was 300, *i.e.* 147 boys and 153 girls. Of these 22 had sound teeth, 10 boys and 12 girls.

A new departure was made this session

Carious Teeth at the Different Ages, with Number of Children at Each Age.

Age.	Sound dentition.		Carious Teeth.						Number of children examined.		
			1 to 4.		5 to 7.		Over 7.		Boys.	Girls.	Totals.
4 yrs.—Boys	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
" —Girls	. .	. .	.	. .	. .	1	. .	. .	. .	1	1
5 yrs.—Boys	3	. .	7	. .	8	. .	11	. .	29	. .	55
" —Girls	. .	4	. .	4	. .	4	. .	14	. .	26	. .
6 yrs.—Boys	3	. .	13	. .	13	. .	17	. .	46	. .	111
" —Girls	. .	6	. .	19	. .	12	. .	28	. .	65	. .
7 yrs.—Boys	. .	. .	14	. .	19	. .	19	. .	52	. .	90
" —Girls	. .	1	. .	7	. .	12	. .	18	. .	38	. .
8 yrs.—Boys	3	. .	2	. .	2	. .	10	. .	17	. .	36
" —Girls	. .	1	. .	8	. .	2	. .	8	. .	19	. .
9 yrs.—Boys	1	. .	1	. .	1	. .	. .	. .	3	. .	. .
" —Girls	. .	. .	. .	. .	. .	2	. .	1	. .	3	6
10 yrs.—Boys	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
" —Girls	. .	. .	. .	. .	. .	1	. .	. .	. .	1	1
Totals { Boys	10	. .	37	. .	43	. .	57	. .	147	. .	300
Totals { Girls	. .	12	. .	38	. .	34	. .	69	. .	153	. .

Summary.

	Boys.	Girls.	Totals.
With sound teeth	10	12	22
" 1 to 4 carious teeth	37	38	75
" 5 " 7 " "	43	34	77
" over 7 " "	57	69	126
Totals	147	153	300

from 10 A.M. to 12.30 P.M., being taken up. In each case requiring treatment notification was sent to parents or guardians. In 32 cases refusals were received, and in 30 cases no answer was returned. Since then it has been found that some in the re-examination of children attending Queen Anne school who had been examined when the clinic was started.

The number examined was 41, *i.e.* 26 girls and 15 boys.

There were 12 new regulation cases

RESULTS OF RE-EXAMINATION.

AGE.	Fillings required.						Fillings already inserted.						Extractions required.			
	1	2	3	4	5	7	1	2	3	4	5	6	1	2	3	4
10 yrs.—Boys . .	1	. .	2	1	. .	.	1	1	. .	. .	. .	.	1	1	. .	.
" —Girls . .	1	1	. .	. .	2	.	1	2	. .	. .	. .	.	1	1	. .	.
11 yrs.—Boys . .	1	2	2	. .	. .	.	1	1	2	. .	1	.	1	1	. .	1
" —Girls . .	1	5	3	1	. .	.	1	5	1	1	2	.	3	. .	. .	.
12 yrs.—Boys . .	1	. .	. .	. .	. .	.	. .	1	. .	. .	. .	.	2	. .	. .	.
" —Girls . .	1	5	. .	. .	. .	1	. .	2	. .	. .	1	1	3	. .	. .	.
13 yrs.—Boys . .	. .	1	. .	. .	. .	.	. .	. .	. .	. .	. .	1	. .	. .	. .	.
" —Girls . .	. .	. .	1	. .	. .	.	. .	1	. .	. .	. .	.	. .	. .	. .	.
14 *yrs.*—Boys . .	. .	. .	. .	. .	. .	.	. .	. .	. .	. .	. .	.	. .	. .	. .	.
" —Girls . .	. .	. .	. .	. .	. .	.	. .	. .	. .	. .	. .	.	. .	. .	. .	.

Summary.

	Boys.	Girls.
Requiring 1 filling	3	3
" 2 fillings	3	11
" 3 "	4	4
" 4 "	1	1
" 5 "	—	2
" 7 "	—	1
" No "	4	4
Totals	15	26
Requiring 1 extraction	4	7
" 2 extractions	2	1
" 4 "	1	—
Totals	7	8
Having 1 filling	2	2
" 2 fillings	3	10
" 3 "	2	1
" 4 "	—	1
" 5 "	1	3
" 6 "	1	1
Totals	9	18

taken in hand, and 40 impressions for regulation purposes to show progress or to record abnormalities. This work has taken up a good deal of time, but the results are most encouraging.

There were 5 cases of extraction under nitrous oxid and oxygen, 2 boys and 3 girls.

One girl aged 13 was supplied with a plate carrying 4 teeth.

Work Done in 1912–13.

(1912.)	Individual Patients.		Attendances.		Dressings and Fillings.		Extractions.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
July	. .	. .	. .	. .	. .	. .	. .	. .
August	. .	. .	34	45	24	29	12	20
September	. .	. .	150	199	108	147	60	72
Totals	. .	. .	184	244	132	176	72	92
			428		*308*		*164*	
October	. .	. .	158	184	100	150	54	60
November	. .	. .	128	156	68	88	48	70
December	. .	. .	96	133	59	69	38	69
Totals	. .	. .	382	473	227	307	140	199
			855		*534*		*339*	
(1913.)								
January	. .	. .	161	182	102	129	55	68
February	. .	. .	202	215	125	147	88	79
March	. .	. .	201	247	114	158	79	99
Totals	. .	. .	564	644	341	434	222	246
			1208		*775*		*468*	
April	. .	. .	145	169	75	102	61	70
May	. .	. .	187	236	97	140	87	105
June	. .	. .	144	228	81	128	54	69
Totals	*954*		476	633	253	370	202	244
			1109		*623*		*446*	

(Extractions included 38 permanent teeth.)

Session 1913-14 (to March).

In spite of drawbacks from changing of rooms and becoming accustomed to other conditions, and want of some conveniences, the amount of work done has been considerable.

The mouths of those children who were mentally defective were examined at the various schools, but these have to be carefully re-examined later on to obtain accurate measurements of the width and depth of palate, by means of a special instrument which has been constructed under my direction.

I also examined the children in the infant department of the St. Leonards school. Out of 225 on the roll, 212 were examined, 13 being absent.

Number of parents who agreed to treatment for their children, 157; objectors, 23. No replies from 18.

Of the 212 examined,

6 boys and 8 girls had sound teeth.
31 " " 40 " " 1 to 4 carious teeth.
39 " " 40 " " 5 " 7 " "
30 " " 18 " " over 7 " "

EXAMINATION OF ST. LEONARDS INFANT DEPARTMENT.

AGE.	Sound dentition.		Number of carious teeth.						Totals.	
			1 to 4.		5 to 7.		Over 7.		Boys.	Girls.
4 yrs.—Boys	1		2		1		2		6	
" —Girls		1		2		1				4
5 yrs.—Boys			3		7		5		15	
" —Girls	3	2		2		4		3		11
6 yrs.—Boys			14		11		10		38	
" —Girls	2	2		15		11		8		36
7 yrs.—Boys			7		9		8		26	
" —Girls		2		10		19		4		35
8 yrs.—Boys			4		11		3		18	
" —Girls		1		10		4		3		18
9 yrs.—Boys			1				1		2	
" —Girls				1		1				2
10 yrs.—Boys							1		1	
" —Girls										
Totals (Boys	6		31		39		30		106	
Totals (Girls		8		40		40		18		106

Summary.

	Boys.	Girls.	Totals.
With sound teeth	6	8	14
" 1 to 4 carious teeth	31	40	71
" 5 " 7 " "	39	40	79
" over 7 " "	30	18	48
Totals	106	106	212

During this period 718 children were treated, 290 boys and 428 girls—this number being made up as follows:

(A) *Discharged cases.*

	Boys.	Girls.
Children examined at school and afterward treated at clinic	64	79
Casual cases (coming voluntarily or sent by teacher or parents)	177	262
Totals	241	341

(B) *Cases still receiving treatment.*

	Boys.	Girls.
Examined at school and afterward treated at clinic	15	17
Casual cases (coming voluntarily or sent by teacher or parents)	34	70
Totals	49	87

	Boys.	Girls.
Total discharged	241	341
Still receiving treatment	49	87
Totals	290	428
Grand total	*718*	

	Boys.	Girls.
Attendances—Sept. 1913 to March 1914	835	1422
Fillings	314	500
Dressings	199	388
In former reports fillings and dressings were not kept separate.)		
Extractions	295	498
Including permanent teeth	8	10
Impressions taken	13	15
Regulations	6	18

Children examined in Board schools slightly dull or mentally defective, 100.

The clinic was closed from November

10th to 21st, and the opportunity was taken of examining the mouths of dull and mentally defective children; fifteen hours were devoted to this work.

In the case of one girl a porcelain inlay was inserted into a cavity and one boy was supplied with a vulcanite plate carrying two artificial teeth.

As some of my friends who have seen the above figures seem doubtful about their correctness, I give the following numbers detailed—fillings, dressings, and extractions for three days of four hours each. It will be noticed that only one permanent tooth has been removed, of the total number extracted during the three days:

1st day.	Boys.	Girls.	Total.
Attendance	22	26	48
Fillings	12	14	26
Dressings	1	5	6
Extractions	8	6	14

(Including 1 permanent tooth.)

2d day.	Boys.	Girls.	Total.
Attendance	22	25	47
Fillings	10	4	14
Dressings	3	6	9
Extractions	9	16	25

3d day.	Boys.	Girls.	Total.
Attendance	18	21	39
Fillings	4	3	7
Dressings	—	6	6
Extractions	10	11	21

The ages of the majority of children were 5 to 8.

WORK DONE FROM SEPTEMBER 1913 TO MARCH 1914. TOTAL PATIENTS, 718.
(SCHOOL WEEKS, 26. HRS., 311.)

(1913.)	Individual patients.		Attendances.		Dressings.		Fillings.		Extractions.		Impressions.		Regulations.	
	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
July	.	.	.	.	.	.	.	.	.	.	.	.	.	.
August	.	.	.	.	.	.	.	.	.	.	.	.	.	.
September	.	.	149	225	27	33	52	84	56	85	2	.	.	.
Totals	.	.	149	225	27	33	52	84	56	85	2	.	.	.
	.	.	*374*		*60*		*136*		*141*		.	.	.	.
October	.	.	206	286	28	56	93	92	68	134	1	1	.	.
November	.	.	75	110	23	25	32	39	19	40	4	3	.	.
December	.	.	100	168	31	54	26	65	41	44	.	.	.	.
Totals	.	.	381	564	82	135	151	196	128	218	5	4	.	.
	.	.	*945*		*217*		*347*		*346*		.	.	.	.
(1914.)														
January	.	.	74	155	22	56	31	53	24	48	2	8	.	.
February	.	.	97	225	25	76	32	87	38	59	2	2	3	9
March	.	.	134	253	43	88	48	80	49	88	2	.	3	9
Totals	.	.	305	633	90	220	111	220	111	195	6	10	6	18
	718		*938*		*310*		*331*		*306*		.	.	.	.

THE FILLING OF TEETH WITH CAST GOLD INLAYS, AND THE PRESENT STATE OF THE ART IN THE UNITED STATES.

By RODRIGUES OTTOLENGUI, M.D.S., D.D.S., LL.D., New York City, U. S. A.

(Report presented to Section III, Sixth International Dental Congress, London, 1914.)

IN 1908, at a meeting of the Odontological Society of New York, Dr. Wm. H. Taggart announced a new method of filling teeth, by making a pattern of the desired filling, investing the same in a seamless mold and reproducing this pattern by casting molten metal under pressure. At the same meeting he presented a casting machine with which this process could be successfully conducted.

The announcement and description of this new method of filling teeth aroused a greater interest than had any other announcement ever made in relation to dental practice. Within a year thousands of men were utilizing the casting process, and numerous inventors and manufacturers were offering for sale casting machines, with which the claim was made that cast fillings could be made to better advantage than with the Taggart apparatus. Your reporter believes that this will be an appropriate moment for dealing briefly with this subject of machines.

CASTING MACHINES.

Casting machines may be divided into three classes: First, those utilizing direct gas pressure, inclusive, of course, of air, steam, and the like; second, those utilizing the forces exerted by centrifugal motion; and third, the so-called suction machines. Men claim success with all these various devices, but it must be remembered that the minds of men vary, and that personal ideas and standards differ proportionately. Suffice it, then, to say that in the opinion of your reporter no machine is the equal of the Taggart apparatus, in support of which view he may state that experts in the use of the Taggart machine, both in New York City and in Chicago, have made test cavities, for which they have readily made accurately fitting castings which experts with other appliances have been unable to duplicate. Conversely, no one has produced a casting with any rival machine which cannot be duplicated with the Taggart.

EARLY PROBLEMS.

With the adoption of the casting process, operators at once met with difficulties and obstacles, and often produced castings so poor that they could not be used. The faults in the inlays were mainly of three kinds. First, inlays larger than the original pattern; second, inlays showing feathers, in two or more directions; third, inlays spoiled by having minute or even large globular masses attached to their surfaces.

Many extensive and more or less scientific investigations and experiments were undertaken to solve these seemingly insurmountable difficulties. Multifarious theories and explanations were advanced to account for these harassing troubles. It is worthy of note that men of keen minds and of analytical judgment nevertheless advanced antagonizing theories in accounting for quite similar phenomena. I need not take up the time of my *confrères* in this congress by recounting the differing views of these different investigators. But let me say this, that in my opinion there would have been less difference of opinion, and less divergence of reported

results, had the investigators been content to take the art as it was given to them by its originator, following his instructions, using his apparatus and materials, and thus working along exactly similar lines of endeavor. Unfortunately this was not the case. Instead of attacking the problems with unbiased minds, our research workers in the main solved the troubles by mental process first, and then undertook to prove themselves correct by clinical methods which, however ingenious, were all destined to fall short of the truth because of the biased state of the minds of the investigators. To make clearer what I am here stating, men who have never used a Taggart machine met definite failures with some other machine, and spent months of energy explaining and accounting for these phenomena as though it were a fact that they would occur with the Taggart or any and all other machines, when often the particular trouble upon which so much scientific research was expended did not occur at all in the practices of the men who had mastered the Taggart process, using Taggart materials, and the Taggart machine.

For these reasons it is the firm belief of your reporter that the art today would be much farther advanced had the dentists of the world adopted Taggart's apparatus and directions from the outset, and had no other machine ever been constructed. For it is an absolute fact that the men who have done this—those that have studied the process and mastered it, those that use Taggart's machine, his wax, and his investment, and use them always in exactly the same manner, have the satisfaction of knowing that every inlay will accurately fit the cavity for which it is constructed. They also know that on the rare occasions when they meet a failure, it has been themselves, and not the process or the materials, that have failed.

THE SOLUTION OF THE PROBLEMS.

It will be appropriate at this point to explain briefly how the faults met with early in practice are really to be explained and obviated. That they have been obviated is demonstrated by the statement that in the office of your reporter, and of several other exclusive followers of Taggart's direction, no inlay has been discarded nor made over during the past three years. I have this assertion from men of national reputation and of undoubted honor.

Referring to the three main faults, previously mentioned, let us consider them briefly. First, Inlays larger than the original pattern. This was no uncommon experience in the early days of the art, and not a few methods of overcoming the trouble were promulgated. One such method was to coat the outer surfaces of the inlay with wax and then reduce the cavo-surface by immersing the inlay for a short time in a gold solvent. Another proposal was to place the wax pattern in ice-water and to mix the investing material with ice-water. The evident theory was that the chilling of the wax and the use of cold in mixing the investment would counteract the expansion of the mold when heated-up to receive the cast metal. But the true method of producing an accurate casting does not depend upon the utilization, but rather upon the avoidance, of extremes of temperature. The wax should not be chilled; the investment should not be made with cold water, and the mold should not be extremely hot when the cast is made. On the contrary, the effort should be made to work as close to room temperature as possible, the wax and investment thus being neither warmer nor colder than the surrounding air, while the mold itself should be as cool as possible, and consequently as little expanded as possible. Success, indeed, depends more upon a constancy and accuracy of technique than upon the utilization of any extraordinary means of overcoming faults which should not occur at all. Such a method will be presently described.

The second fault, that of having feathers extending from the casting, is directly traceable to three co-operating causes. First, the use of an investment

which will crack during the heating necessary for burning out the wax; second, the presence of these cracks in the investment, especially when the mold is hot at the moment of casting, thus opening the cracks to their ultimate. Third, the use of too great pressure in casting, thus forcing the molten metal into the crevices. The obviation, therefore, depends upon the use of an investment which does not crack at the temperature needed for melting out the wax; second, upon permitting the mold to become as cool as room temperature will allow, and keeping it as cool as possible during the casting, and finally, upon using a low pressure, so as to avoid causing crevices.

Lastly, the presence of globules on the surface of the inlays is mainly due to improper mixing of the investment or to improper application of the investing compound to the surface of the inlay, or to both combined.

THE SUCCESSFUL PROCESS.

The following are the essential steps in the process if accurate results are to be had:

First, the wax used for the pattern should soften at a moderate degree of heat, and should harden at the ordinary temperature of the mouth. It should not be overheated, but should be softened sufficiently to take an accurate impression of the cavo-surface and of the margins, yet kept hard enough so that the mass of the material furnishes resistance under pressure, sufficient to force the outer surface accurately against the cavity walls and margins. The wax once seated, pressure should be continued until the wax has fully hardened. This pressure should be constant and in the direction best assuring the certainty of producing accurate adaptation. Pressure continued in this manner guarantees us that the wax is accurately fitted to the cavity, not a few moments prior to its hardening, but at the final moment of hardening, after which there will be no danger of alteration through contraction, provided the wax is not cast into water colder than room temperature. The best method of assuring the unalterableness of the pattern is to invest it immediately, using water at room temperature.

Having thus procured a pattern fitting at the moment of complete congelation, the next step is properly to invest the same. The investment and water should be always weighed so as to insure definite results. It should be slow-setting, and should be rotated for at least five minutes to insure the expulsion of air-globules. It then should be evenly spread around the pattern, and the surrounding secondary investment poured in such a manner that the operator may be assured that during the process the primary investment does not move so as to expose any surface of the pattern, thus inviting the imprisonment of air during the addition of the secondary investment, which of course should be made with the same mix of material used for coating the pattern.

The wax should be removed with moderate heat, and this heat should be continued until all gases resulting from the combustion of the wax shall have been eliminated. This heat should never be extreme enough to risk injury to the mold by overheating, nor should it be too long prolonged. A definite burner should be used, and a definite time employed, for by this means only can definite results be obtained. The mold should then be permitted to cool to room temperature.

Many wonder what is meant by the phrase "casting in a cold mold." By this is meant that the mold should be as cold as possible. It will necessarily become heated during the melting of the gold, but it is manifest that if the coefficient of expansion and contraction of the investing material at that temperature be the same as the coefficient of expansion and contraction of the melted metal, this slight expansion of the mold aids rather than hinders the accuracy of the result. The gold should be placed in the crucible of the mold, and the blowpipe flame kept small so as to play on the gold rather than upon the mold.

In this manner the gold can be melted to the boiling-point, while the metal ring around the mold will be only a little too warm to be taken in the fingers.

The pressure should be low. Those who use the Taggart machine should have the pressure gage register about 5 lb. when the blowpipe flame is in use. The register will rise to 6 or 7 when the cast is made. Finally a large excess of gold will insure a better casting than where a small nugget is used. The above process accurately used will produce inlays which will fit as well as the wax pattern. No process can do better. If the fit is faulty, either the pattern was at fault or some other step in the process must have been inadequately observed.

METHODS OF MAKING THE WAX PATTERN.

When Dr. Taggart first disclosed his method he directed that the wax should be pressed into the cavity of the tooth itself, carved into desired shape, removed and reproduced in gold by casting. This has now come to be known as the "direct method." But another method is much advocated by many prominent practitioners, which is known as the "indirect method." This involves taking an impression of the cavity in an impression wax and from this making a replica of the original cavity (sometimes called a mold, or die) in which to form the wax pattern. This replica is made of various materials, such as cement, one of the quick-setting silver-tin amalgams, or copper amalgam.

For the indirect method many advantages are claimed, the more valid of which are as follows:

First: If a casting is spoiled, another may be made without recalling the patient. This can only appeal to those using unreliable machines or materials, or inconstant methods. As has already been explained, with a proper machine and a definite technique constantly followed, failure is absolutely not necessary.

Second: Greater facility in carving the pattern to proper form. This is largely a matter of personal preference. Many who use the direct method claim greater satisfaction in carving in the mouth with the adjacent natural teeth as a guide.

Third: Greater perfection of adaptation at the margins, especially at the cervical margin, and more particularly so when this margin is below the gum tissue. In reply, the direct-method men declare that if a perfect impression of all the margins can be obtained with the impression wax, it can likewise be obtained with the pattern wax, and that a better marginal fit will be had if this original first impression be utilized for making the pattern.

Other advantages are claimed for the indirect method, and disputed by the direct-method men, but probably the only real advantage, if indeed this be one, is that the indirect method permits the operator to relegate a larger share of the work to an assistant. By this means he needs only to take an impression of his cavity, give this to his assistant, and at a subsequent sitting receive the inlay ready to cement to place.

There is no doubt that beautiful work is done by men of both schools, and while your reporter believes that the expert with the direct method will always make a better inlay than the man equally expert with the indirect method. he is not at all sure that the percentage of dentists per thousand who could accomplish satisfactory results may not be greater with the indirect method than with the direct.

Against the indirect method it must be said that, if the operator himself should do all of the work, he must lose a great deal of time, for manifestly all the time expended in investing the impression and making the replica is time added to the process.

It would be extremely interesting and instructive to have the question of the adaptation of inlays made by the indirect method scientifically tested. It is the firm belief of your reporter that inlays made by the indirect method are smaller than would be an accurate pattern made in the original cavity. This

explains the ease with which the majority of inlays made in this manner may be set, and the difficulties met with in complicated forms, such as those for M.O.D. (mesial-occlusal-distal) cavities. This also explains why so many advocate that the M.O.D. cavity should be filled with two inlays, interlocking together, whereas the workers by the direct method make a single inlay for this style of cavity.

CAVITY MARGINS.

Your reporter does not consider that cavity preparation is strictly a part of the subject apportioned to him, but he would like briefly to touch upon a single aspect thereof, because of a feature which is not widely known.

There has been much contention as to whether the cavity should be prepared with a beveled margin, or as for a butt joint. Those who favor the beveled margin declare that the arrangement of the enamel rods demands that a bevel equal to at least one-third of the length of the rods is essential to future safety. Those who like the butt joint demand that the margins of both enamel and inlay should be as nearly as possible at a right angle, and they argue that this arrangement leaves the enamel rods strong, because the enamel rod usually lies at a right angle with the tooth surface. They point out that whereas the bevel may be necessary with the gold foil filling, where the foil is malleted against the actual margins of the enamel rods, such is not the case with the inlay, and the beveling only makes a weak margin of gold, which later will turn away and expose a seam for the inroads of new caries.

There is, however, another method of fashioning the margin which is worthy of consideration. So far as your reporter has been able to learn, this method is original with Dr. M. L. Rhein of New York, and has been adopted by only a few others. Yet your reporter has seen such beautiful results with this method that it seems important that it should be reported.

This arrangement must be called the "lapped joint." In treating the approximal surfaces, to which it especially applies, a chisel or disk is used between the teeth, and the margins of the cavity trimmed away to a flat plane, and the trimming is extended until the entire bell-shape form of the tooth has been removed. This yields considerable approximal space, and facilitates the taking of the impression of the cavity. It leaves the approximal margins flat, with the lingual and buccal margins in the same plane, which plane is slightly inclined away from the gum toward the occlusal surface. For fear that I have not made this entirely clear (which is difficult to do without models) let me further state that if we examine these flat approximal margins we will note that they are comparatively wide, with one angle formed by the surface of the margin and the buccal enamel surface, and a second angle formed by the surface of the cavity margin and the dentinal surface of the cavity. It is the extension of the inlay over this flat margin which accounts for the term "lapped joint."

This style of margin may be utilized with the direct method, but it is more readily used with the indirect, for the reason that the extreme buccal and lingual edges of the gold which makes the lap is brought to a very sharp edge, which is easily injured in removal from the mouth. Using the indirect method, the pattern wax is extended over the margins considerably, and this excess is polished off after making the cast, the polishing being carefully done with the gold inlay returned to the metal replica of the tooth.

CHOICE OF GOLD.

A very large number of prominent men, whose opinions must be treated with respect, have concluded that pure gold when cast is not sufficiently hard for filling teeth. To obtain a harder metal various alloys are used, probably the best being pure gold alloyed with from 2 to 5 or even 6 per cent. of platinum.

In spite of the great number of men who have abandoned pure gold, and with all due respect to the opinions of my prominent *confrères,* your reporter is compelled by personal experience to proclaim his allegiance to pure gold, and he is solaced by the fact that he is still sustained in this opinion by the inventor of the method.

After using pure gold for about a year, your reporter observed some of the marring of occlusal surfaces and other troubles, complained of by his *confrères,* and following their lead he used gold alloyed with platinum for about another year, when he came to the conclusion that the greater difficulties in obtaining accurate adaptation more than offset the advantages of a harder surface. There is no doubt that the pure gold can be more accurately cast than any alloy thereof, and consequently it should be some very pronounced advantage which would tempt us to forsake that metal.

Your reporter therefore abandoned the alloys and returned to the use of pure gold. By this time also he was partially awakened to the necessity of more accurately reproducing the occlusal forms of teeth, but later still he became fully aroused on this subject by the several communications of Dr. J. Lowe Young, and at the present time he unhesitatingly asserts that, if anything like accuracy is attained in reproducing tooth form, and occlusion, with the gold inlay, pure gold is the best metal with which to serve the patient, and that under these conditions it will be found quite hard enough to withstand all natural masticatory stresses. In other words it was the malformation and malocclusion of the early inlays, rather than the supposed softness of the metal which occasioned the damages reported, which included everything from bruised surfaces of the gold to the splitting-off of sections of tooth tissue.

OCCLUSION.

We come now to the most important feature of the entire gold inlay proposition. The natural teeth were given us for the mastication of food. They were undoubtedly made for a special design that they might adequately accomplish this function. In proportion as mastication is thoroughly well effected is the individual well or ill. Hence we may declare without opportunity for dissension that the health of a man is to a great degree dependent upon the occlusal form of his teeth, since upon this form must depend the efficiency of these organs in mastication.

In the past the occlusal forms of molars and bicuspids have rarely been copied even in the crudest manner, with gold foil fillings. Nor is it very practical to do this, carving the dense hard gold after it has been placed in the tooth. But with the gold inlay process, using as we do a plastic wax for forming the original pattern, the carving and reproduction of the actual tooth surface is only limited by the skill of the operator.

This subject is of too great a magnitude to be thoroughly treated in a report of this character. Let me only say that a great awakening to the opportunities is even now occurring in the United States. Several enthusiasts are giving their time visiting dental societies throughout the country, explaining and exploiting the new doctrine. Already the spirit of the movement is evidenced by an improved teaching in the schools.

I would be derelict, however, if I did not point out the most important feature of this most important new technique. It was long ago taught and later definitely proved by Prof. G. V. Black, that actual approximal contact of the teeth is essential to the health of the interproximal tissues, and this is as true today as when the dogma was first promulgated. But in the light of the newer teaching we discover why it has been that so often, in spite of accurate approximal contact, the gingival tissues have suffered, gingivitis has ensued, and too frequently septal abscesses have formed. We have wondered how food could have been forced between teeth so close together that it appeared difficult

to pass a silk thread between the classically formed contact points.

This mystery is a mystery no longer. Normally teeth are movable in their sockets, and no contact of adjacent teeth will alone prevent the ingress of food where the masticatory stress of the individual is above the average.

A study of the dental organs in a state of health discloses the fact that one cusp of a molar tooth is received by the fossa of its antagonist in the opposite jaw, while the other antagonizes with a fossa formed by the inclined planes of two opposing teeth. In the first instance we find that the summit of the cusp, as it reaches the bottom of the fossa of its antagonist, is met by a cross sulcus leading lingually and buccally, so that the food crushed at this point is forced in the direction of this sulcus. Where the cusp antagonizes two teeth we find each of these opposing teeth protected by a marginal ridge. This marginal ridge has its inclined plane leading toward the center of the tooth and consequently away from the interproximal space. Moreover, at the extreme depth of this incline we find a crescentic groove or sulcus, the horns of which pass outward and inward, buccally and lingually, so that food crushed at this point is forcibly ejected away from, rather than toward, and into, the interproximal space.

Your reporter is quite ready to admit that this condition is not prominently present in all teeth nor in all types of teeth. But by a study of the best type of teeth shall we learn the protective intention of Nature in this provision. So important does this point seem to your reporter that he makes an earnest appeal, not only for the restoration of the occlusal surfaces of molars and bicuspids, in as exact accordance with nature as possible, but he would urge that the mesial and distal marginal ridges, with their inclined planes and crescentic sulci, be accentuated even to a greater degree than they may exist in other dental members of the same mouth. When we consider that the tooth is already in a state of disease, we cannot take too many precautions to protect it from a new attack.

It is your reporter's belief that much gingival disease has been inaugurated by flat fillings, which have had a tendency to force food into rather than away from the interproximal spaces. Such fillings, while they may have saved the teeth, have injured the tissues of the mouth by packing food against the soft tissues; and have injured distant organs of the body by burdening them with an excessive share of the processes of digestion. All these troubles may be avoided, and the patient's masticating apparatus may be perfectly restored if we conscientiously utilize the opportunities afforded us by the cast gold inlay process.

INLAYS FOR DIFFICULT POSITIONS.

In conclusion let me describe three types of inlays which have been formulated for positions of special difficulty.

First picture to your mind a distal approximal cavity in a molar, complicated by the presence of a cavity at the buccal aspect, near the gum. The tooth substance between the two cavities may be so poor that a thorough excavation would make the two cavities continuous. This is a condition in which it is manifest that a single inlay cannot be used. The procedure is as follows: An inlay is first made for the buccal cavity, and is finished and set so that one edge of it becomes a part of the margin of the approximal cavity. A second inlay is made for the approximal cavity, and when set completes the operation. If well done it will seem to be but one inlay.

In so-called M.O.D. cavities it is the common practice to fashion an inlay for the distal and half of the occlusal part of the cavity, cutting a box or dovetail in the occlusal extension. This is set and a second inlay is made for the mesial portion of the cavity, interlocking with the first inlay when set. As has been already stated, this procedure is seldom requisite when the M.O.D. cavity presents at the outset, but it is an important technique when a cavity

appears in the approximal part of a tooth which already carries an inlay in the other approximal surface, seated and anchored in the occlusal surface. In such cases an interlocking of the two inlays assures permanency for both.

With the first introduction of the gold inlay attempts were made to produce an inlay which would have its conspicuous surface covered with porcelain. Many methods were tried but none has seemed so satisfactory as a method recently shown and now much utilized in the United States. This method even permits the use of a gold inlay in the anterior teeth. The procedure is to make a gold inlay of such form that all that part where strength is required shall be of gold. Such part as would be easily seen is cut away from the wax pattern and a box is formed, one edge of which shall be the margin of the tooth, the box of course only appearing as a box when the inlay is set. After setting the inlay this box is filled with a synthetic cement to match the tooth. Such combination inlays having been made, it was discovered that the beautiful transparency of the cement was lost by having the gold back of the filling, but in the more recent inlays of this character this fault has been largely overcome by cutting windows completely through the gold. These windows afford a better hold for the cement, and by permitting the passage of light restore the translucency.

THE CHEMISTRY AND PHYSIOLOGY OF THE SALIVA.

By EDWARD C. KIRK, D.D.S., Sc.D., Philadelphia, Pa.

(Report read before Section I of the Sixth International Dental Congress, London, 1914.)

IN presenting for your consideration a report upon the Chemistry and Physiology of the Saliva, in the absence of specific directions as to the nature and scope of the report which it was desired that I should make, I have assumed that I should report only upon the work done on this subject in America, and for the period intervening since the holding of the Fifth International Dental Congress in Berlin in August 1909. My report will therefore be made subject to these limitations, as I presume that others will report upon the progress of the work done in their own countries in this particular field.

By far the most important series of researches upon the chemistry and physiology of the saliva undertaken in America is that conducted by Prof. Wm. J. Gies of the department of biological chemistry of the College of Physicians and Surgeons, Columbia University, New York, under the auspices of the Dental Society of the State of New York and of the New York Institute of Stomatology respectively.

The initiatory impulse leading to the serious investigation of the significance of the sulfocyanate content of the saliva doubtless had its origin, so far as America is concerned, in a report made by the Committee on Scientific Research, Dr. F. W. Low being then its chairman, to the Dental Society of the State of New York at its annual meeting in 1905, and similarly in 1906, in which reports attention was focused upon the possibility that the sulfocyanates of the saliva might exert a retarding influence upon carious destruction of the teeth, either directly, by an inhibitive effect upon the micro-organisms concerned in caries production, or by interfering with plaque formation and thus preventing localization of the caries-producing agencies.

The question thus raised excited wide-

spread interest, and—notwithstanding the recorded and apparently convincing work of previous investigators on this same subject, notably that of Hugenschmidt and of Miller—the demand for further knowledge of the rôle, if any, played by sulfocyanates in the saliva, especially with reference to dental caries, determined the Research Committee of the Dental Society of the State of New York seriously and scientifically to investigate the question. The assistance of Prof. Wm. J. Gies of Columbia University, an eminent biological chemist, was sought and his interest aroused in the problem. A series of important researches were undertaken under the direction of Dr. Gies, with the result that the question of the activity of the sulfocyanates in the saliva, in so far as they were assumed to have any inhibitory influence whatsoever upon the inception or progress of dental caries, was answered in the negative.

In connection with the work upon the sulfocyanates conducted by Professor Gies, collateral researches were made upon the biochemistry of the saliva with a view to throwing more light upon the possible relationships which the composition and character of the saliva might bear to the carious process. I cannot do better than present Dr. Gies' own *résumé* of the character and scope of the work which he has carried out, as follows:

Our work in dental chemistry was inaugurated in the fall of 1909, as a result of requests and suggestions by the Research Committee of the New York Institute of Stomatology, Dr. J. Morgan Howe chairman. Realizing the fact that biological chemists had wholly ignored the important field of dental chemistry, and appreciating the special opportunity to serve the dental profession in response to its call for co-operation, I gladly placed the resources of our laboratories behind the proposed investigation of dental caries. This work has been in progress since.

In March 1910, the Research Committee of the Dental Society of the State of New York, Dr. Wm. B. Dunning chairman, invited me to repeat and extend certain experiments which had previously been conducted on the possible relation of salivary sulfocyanate to the condition of the teeth. With the approval of the New York Institute of Stomatology, I accepted this invitation. This work has since been in progress, with an interruption of one year.

Since 1910, then, we have been conducting two series of investigations of dental caries under the auspices of two dental organizations.

When these researches were begun I was greatly embarrassed by my utter ignorance of dentistry. It has taken several years of hard study and earnest work to overcome, to a small extent, that very severe handicap. As a consequence we have accomplished very little, though I feel that we are "getting under way."

For convenience let me refer separately to our researches under the two different auspices referred to above, as indicated by the headings below:

Research under the Auspices of the First District Dental Society of the State of New York.

1909–10. A chemical study of saliva in its probable relation to the decay of teeth (with Alfred P. Lothrop). Two papers, *Journal of the Allied Dental Societies*, 1910, vol. v, p. 262, and 1911, vol. vi, p. 65. Our data failed to show any definite relation between common qualities and constituents of saliva and the condition of the teeth of the individual studied. We were unable to infer, from our data, that caries is due to the positive or negative influence of any one, or any combination, of *purely salivary* constituents. It was suggested that food-acid media might be valuable dentifrices.

1910–11. Further studies of saliva in its probable relation to the decay of teeth, with special reference to sulfocyanate, nitrite, and oral micro-organisms (with Alfred P. Lothrop, Clayton S. Smith, and Elmer W. Baker). Four papers, *Journal of the Allied Dental Societies*, 1911, vol. vi, pp. 289, 297, 323, and 334. Negative findings in the cases of sulfocyanate and nitrite. *Nothing new* on the relation of oral micro-organisms. Importance of chemical studies of mucin emphasized, from the standpoints of plaque formation and effects thereon of food-acid media.

1911–12. Studies of salivary mucin, from the chemical standpoint primarily, with further emphasis on the probable effectiveness of food-acid media as dentifrices and suggestion of important bearings of internal secretions on dental conditions (with Alfred P. Lothrop). Three papers, *Journal of the*

Allied Dental Societies, 1912, vol. vii, pp. 199, 397, and 410.

A *résumé* of the findings in the foregoing papers for 1910, 1911, and 1912 is given in the *Journal of the Allied Dental Societies*, 1913, vol. viii, p. 284.

1912–13. Continuation of the study of a possible prophylactic influence of food-acid media, with further emphasis upon the bearing of internal secretions on dental conditions (with Alfred P. Lothrop). One paper, *Journal of the Allied Dental Societies*, 1913, vol. viii, p. 283. Food-acid media, represented by vinegar diluted with water (1 : 1), applied as dentifrices twice daily for six months, were without discernible destructive effect on extracted teeth (sound teeth and teeth containing fillings of various kinds). Further study has confirmed this finding.

1913–14. Program for the year: *One line* of research is, for the present, historical in character, and consists of the preparation of abstracts of all the essential contributions to the world literature as it now stands on the subject of dental caries, the plan being to publish the abstracts in a comprehensive edition as a monograph on this subject for the future benefit of all students and investigators of dental caries.

A *second line* of investigation relates to a continuance of our study of the possible utility of food-acid media as dentifrices. Included in this line of research will be a further study of the effect of such media on enamel and on dentin.

A *third line* of research involves a chemical study of enamel and dentin, and of the nutritional influences (internal secretions and vitamines, especially) that may modify the mobilization of calcium phosphate and other dental constituents, and thus presumably affect the susceptibility of the teeth to caries.

The *second* and *third* lines of research, evolving on the basis of cumulative findings, are not as clearly defined in our minds at present, *so far as outcome is concerned*, as the first plan above alluded to. The plans will be changed as the results of the researches determine.

The foregoing lines of investigation for 1913–14 have appeared to be urgent; they have temporarily postponed further attention to the general studies with which we inaugurated our research, viz, the causative or coincidental relation of saliva to the condition of the teeth, the systemic conditions that may affect the saliva significantly from the standpoint of dental disease, and the particular relation, if any, of salivary mucin to caries. We intend to return to a study of these subjects as soon as possible.

Research under the Auspices of the Dental Society of the State of New York. Included in Annual Reports of the Research Committee, Dr. Wm. B. Dunning chairman.

1909–10. Investigations on plaque formation and dental caries in relation to saliva, with special reference to previous claims that salivary sulfocyanate inhibits plaque formation (with Emily C. Seaman). Dental Cosmos, 1910, vol. lii, p. 1141. Negative findings.

1910–11. Suggestions of further work. Dental Cosmos, 1911, vol. liii, p. 1324. No work done.

1911–12. An inquiry into the possible relation of sulfocyanate to dental caries, with special reference to the origin of sulfocyanate (with Max Kahn). Dental Cosmos, 1913, vol. lv, p. 40. Negative findings in relation to dental caries.

1912–13. A further inquiry into the possible relation of sulfocyanate to dental caries, with a study of its pharmacology; also suggestions regarding the bearing of internal secretions on dental conditions (with C. C. Lieb and Max Kahn). Dental Cosmos, 1914, vol. lvi, p. 175. Facts pertaining to origin and significance of sulfocyanate, *as a waste product of no functional import in the mouth*, more definitely established.

1913–14. Program for the year: Study of the influence of internal secretions on dental conditions, with special reference to the mobilization of calcium phosphate and other dentin and enamel constituents.

In connection with the sulfocyanate problem Prof. Russell W. Bunting, of the Dental School of Michigan University, has reported in two papers (Dental Cosmos, 1910, vol. lii, p. 1346, and Dental Cosmos, 1914, vol. lvi, p. 285) the results of his researches upon the sulfocyanate question, dealing more particularly with the technique for the detection and determination of sulfocyanates. The technique of Dr. Bunting has been strongly criticized by Professor Gies, the discussion being too elaborate and technical to report upon in detail, but it is recorded *in extenso* in Dental Cosmos for July of this year (1914), vol. lvi, p. 856.

The important question of the localization of the carious process through the fixation of caries-producing bacteria upon tooth surfaces through the agency of the so-called bacterial plaque, as de-

scribed by J. Leon Williams and by G. V. Black, has been developed somewhat further by the suggestion of the writer made in 1909 (DENTAL COSMOS, vol. li, p. 1451) and later experimentally demonstrated (DENTAL COSMOS, vol. lii, p. 737) that the mucinates of the saliva constitute an important factor in plaque formation, as it was found that with caries-producing organisms grown in a mucinous saliva containing fermentable carbohydrates in solution, *e.g.* glucose, the lactic acid produced by the bacterial enzyme precipitated the mucin upon the bodies of the caries-producing organisms, cementing them to the surface, upon which they were permitted to lodge and remain undisturbed.

The work of other investigators, notably of Gies and Bunting, has established the correctness of this view as one of the important means of plaque formation. The work of Bunting reported at the recent meeting of the National Dental Association of America in Rochester, New York, records his experiments in the artificial growing of plaques from saliva upon glass slides and in test-tubes. He finds that such plaques can be grown readily from any saliva, and that they form upon and adhere to the smoothest glass. Inasmuch as the growing of the mucinous plaque is directly dependent upon the soluble carbohydrate pabulum in the saliva, Bunting has undertaken to estimate the total carbohydrate content of salivas, and to study the fermentative processes thereof. He reports that there is a variable quantity of carbohydrate, which may be demonstrated with Fehling's solution after the carbohydrates of the saliva have been split by acid and high temperature and pressure; also that after an incubation of three hours the carbohydrate cannot be determined. He has found a great variance in all the tests made in different salivas as to the relative rapidity with which fermentation takes place upon carbohydrates, and experimentally introduced into various salivas, but he has not been able to find any definite correspondence between his results of fermentation tests and conditions of caries susceptibility and immunity.

The part played by the mucinates of the saliva in plaque formation, also their probable relationship to tartar formation, have assumed by reason of these relations considerable importance, and a number of investigators, notably Professor Gies and his colleagues, Bunting, and the writer, are prosecuting further studies in the hope of determining the rôle which this material plays in several oral pathological states.

An important contribution to the problem of tartar formation is a communication by Dr. G. V. Black (*Items of Interest,* June 1911, p. 436, and repeated in its essential features with some additions in the *Dental Review* for April 1912, p. 337). Some of the conclusions stated by Dr. Black as the result of his investigations of the subject of salivary calculus are remarkable and revolutionary. Previous theories as to tartar formation, Dr. Black states, "seem to suppose that the formation of salivary calculus is due to a play of chemical affinities in the fluids of the mouth itself." "This," he states, "now seems to me to be untenable." He has studied the well-known deposit which has been generally observed to take place upon the surface of artificial dentures, and says concerning it:

> The study of the occurrence of the deposits, followed day by day and often four or five times per day, gave important information. It showed in the most conclusive way that the deposit of calculus is paroxysmal. These paroxysms of deposit occur with extreme irregularity. For a considerable time they seemed to come without cause or effect further than the fact of the deposit. It was soon discovered, however, that a paroxysm of deposit of calculus was generally—though not in all cases—preceded by a deposit of a gummy material that was not dissolved away in running water, hot or cold, and which gave no appearance of calcium salts. Afterward when the plate was otherwise clean, this material remained, giving that part of the plate a shining, varnished look and causing it to feel slightly greasy to the fingers. Generally it is perfectly transparent, not hiding the plate in any degree. I have seen

this material spread over the entire plate, though such an amount of it is rare. More generally it is confined to the neighborhood of the salivary ducts. It is coagulated and whitened by boiling water and by alcohol or phenol. In this it behaves much like albumin. Sometimes the entire deposit will be of this clear material, but the rule is that a white or grayish color appears in the central part and spreads more or less widely over the area. The fact that I observed this order of deposit in my examinations, coupled with the general idea that the calcium salt was a precipitate from the saliva—which I had held in harmony with general opinion—led me to say in my first writing that this agglutinating material was deposited first, and the precipitated calcium salts became entangled in it. It now seems to me that this was an error. After watching it longer and studying the deposit closer, I am more inclined to the opinion that a certain variety, or quality, of the gummy material carries the calcium salt with it because of a chemotactic quality that brings about this addition of salts. The fact remains, however, that the calcium salt is in the form of a precipitate and remains in that form in the hard calculus. This white material is a stronger, thicker deposit than the clear material about it, and it constitutes the bulk of the deposit in the more ordinary paroxysms. The abatement of the paroxysm is usually in the reverse order, the clear material continuing for a short time after the white deposits cease.

Dr. Black calls this clear deposit as a whole "agglutinin of calculus," and states further that "the agglutinin is composed of several varieties of globulin," which later he defines as "any one of a class of albuminous proteid compounds insoluble in water or alcohol but soluble in weak solutions of the neutral salts." "These globulins," he says—

> are the most important of the proteid compounds. The common physiological processes could not be carried on without them. Yet in the condition we are discussing, these globulins serve as the agglutinin in the formation of salivary calculus, and seem to determine its deposit. The thought that these globulins, so important in the animal economy, take part in such a process, and that conditions occur in which the secretions and excretions are loaded with them, including the urine, has been very distasteful to me. But the facts I have been reciting seem to enforce this view. I can no longer think of it as having been formed in the mouth.

The article under consideration continues with a description of a number of slides of specimens of deposits variously stained, and under different magnifications, together with the author's personal experience in controlling the paroxysms of tartar deposit by modifications of diet and by the use of saline purgatives.

Any observations reported by Dr. Black necessarily demand thoughtful consideration. To the writer an analysis of his findings is far from convincing. First, because none of the tests or observations made by Dr. Black with reference to the nature of the clear sticky, gummy deposit which he has reported, seem to warrant the conclusion that the substance which he designates as "agglutinin of calculus" may be properly designated as "globulin." On the contrary, the conditions under which the deposit is formed, and the physical and chemical characteristics of the deposit itself, seem to answer more precisely to the characteristics of precipitated mucin than they do to deposited globulin, whatever form of globulin it may be considered to be by Dr. Black, nor does any of the evidence submitted by Dr. Black in support of his conclusions seem to the writer to justify his generalization that the theory that tartar formation is due to a play of chemical affinities in the fluids of the mouth itself is untenable; for, even granting that lime salts are precipitated in the colloidal organic mass which Dr. Black designates as the agglutinin of calculus, yet to regard the precipitation of lime salts within the colloidal matrix in which they are contained as being chemotactic, and not chemical, involves an assumption not warranted by the observations which Dr. Black reports in his paper and not in harmony with the studies in an analogous field made by Rainey, Harting, and Ord, about 1858. The importance of this department of salivary investigations demands further and careful study.

A question of fundamental importance in connection with the study of the saliva is its varying and variable reaction. The records of observations upon the reaction of the saliva, in so far as they appear in contributions to dental literature, are open to justifiable criticism as to their accuracy. The whole subject of salivary reaction needs careful revision and the utilization of more precise methods for its accurate determination.

Recently the writer has suggested the use of the hydrogen electrode of Hildebrand for the electrometric determination of the hydrogen ion content of the saliva. The electrometric method in this connection is under investigation and promises to yield satisfactory results within the sphere of its applicability. Precise determination of salivary reaction is a *sine qua non* in the further study of the dissolved carbohydrate content of the saliva, especially in connection with fermentation tests. Bunting, who at the suggestion of the writer has been independently studying the electrometric method of determining the reaction of the saliva, records the interesting point that he has found that all salivas give a reading on the alkaline side of the neutral point, but when acids or alkalis are introduced into them, a variable portion of either will enter into combination with the saliva, which he regards as another evidence of the amphotericity of saliva.

It seems probable that before we can arrive at a reliable technique for determining with accuracy the reaction of the saliva in any given instance, it will be necessary to compare the results of observations made with a number of indicators in comparison with the results obtained by the electrometric method. Work upon this phase of the subject is actively in progress.

The dissolved carbohydrate content of the saliva furnishes a problem of major importance. Its significance is apparent when we come to consider its relation to the etiology of dental caries, and more particularly to the vexed question of the observed variability in susceptibility among individuals to that devastating disorder. The theory that caries originates wholly by the fermentation of adherent alimentary food débris falls far short of explaining many of the phenomena of dental caries, and altogether fails to account for the variable susceptibility of individuals to the disorder. The more critically the subject is studied, the more evident it becomes that there is a constitutional or systemic factor in the etiology of dental caries. The writer, with others, has directed attention to the fact that in certain salivas the soluble carbohydrate may be found by the ordinary copper reduction test of Fehling. The origin of this soluble carbohydrate is obscure. The writer has called attention to the probability that disturbances of the hypophysis cerebri, particularly the posterior lobe of the pituitary body, occurring during dentition and pregnancy and through the early periods of rapid growth, may bring about an overflow of glucose into the saliva from the blood stream, which may thus create conditions of increased susceptibility at the periods referred to. Prof. Clarence J. Grieves of Baltimore in a recent paper has further elaborated the same thought and directed attention to the importance of the activities of the ductless gland system in modifying, among other things, the composition of the saliva. Further investigation of this important phase of salivary work is in progress.

Much light has been thrown upon the comparative value of fermentation tests in relation to the soluble carbohydrate content of the saliva by the observations of Dr. Percy R. Howe of Boston. In a paper entitled "The Accelerating and Inhibiting Agents in the Oral Secretions" (DENTAL COSMOS, May 1912), Dr. Howe states his "experiments were carried out in an endeavor to ascertain the action of certain salts upon carbohydrate fermentation":

> **The object of the work was to establish some connection between salivary composition and tooth decay.**
>
> **The method employed consisted of adding the salts to standardized sugar and starch**

solutions, infecting them with saliva or lactic bacteria, and incubating them. The resulting lactic acid formed was estimated by titrating aliquot parts against N/100 NaOH, using phenol-phthalein as an indicator. A comparison was made with controls.

The salts were some of those whose presence had been determined, or which we had physiological reasons to believe were to be found in the saliva during systemic phases. They consisted of di-ammonium phosphate, di-potassium phosphate, di- and mono-sodium phosphate, sodium and ammonium phosphate, potassium, sodium, and ammonium chlorids.

The sugars, maltose, levulose, dextrose, fructose, and various food starches were employed to furnish the fermentable media.

This work disclosed the fact that the phosphates cause an increase of from 200 to 800 per cent. in the lactic acid formation as compared with controls. The period of incubation was from fifteen to twenty-four hours. It is further to be seen that not only is a greater amount of acid formed, but that it is formed in a much shorter time and in a rapidly increasing ratio.

A comparison of the action of the different phosphates shows that di-ammonium phosphate produces the greatest acceleration and virulency of growth as calculated from the lactic acid formed.

The difference in effect between mono- and di-basic sodium phosphate is instructive. The di-basic produces the more acid and with more rapidity. With respect to the chlorids it is demonstrated that they slightly inhibit the bacterial action, reducing it by one-half, in the strength used, so that the action is practically *nil*, and is in no degree augmenting. Ammonium chlorid forms an exception to the rule and augments the growth. In this connection the action of carbonates may be mentioned. These salts, so far as I have determined, do not interfere with the bacterial fermentation of sugars and starches. Analysis shows that they lose their degree of alkalinity and that CO_2 is evolved, signifying acid production. It may be reasonably concluded from these experiments that the phosphates furnish a stimulant for bacterial nutrition, as they do for higher forms of flora. This opinion is further strengthened by the action of the di-ammonium phosphate, for from this salt not only is the augmenting action of the phosphates evident, but an additional source of bacterial nutrient material is shown by the greater degree of acid formed. This is to be accounted for by its ability to furnish nitrogen, which is absolutely essential to bacterial life. Even as the salt of a stronger acid, this base acts to supply the nitrogen for bacterial proliferation, as is here demonstrated in the case of ammonium chlorid.

The effect of $H+$ and $-OH$ ions (indicative of acidity or alkalinity) upon bacterial growth is to be distinguished in the comparison of the action between mono- and di-basic sodium phosphate. The greater amount of lactic acid is produced in the presence of the di-basic salt. The base of this salt replaces more of the $H+$ ions of the phosphoric acid, and is therefore the more alkaline in reaction. We have here further evidence in support of the opinion that bacterial life progresses more favorably in an alkaline medium than in an acid medium.

Other accelerating agents include the albumin and globulins of the saliva, or the glyco-proteid mucin, when they have been subjected to the action on proteolytic bacteria, as they then afford nitrogen.

By adding amino-acids to cultures, I have found the acid production to be greatly increased.

Local infective processes of the gums, tonsils, sinuses, and nasal passages, adenoids, inflammations of the pillars of the fauces and uvula, or catarrhal conditions in which the colloids of the mouth show evidences of alterations or liquefaction by bacteria, are distinct aids to lactic acid forming organisms through affording available nitrogen, as I have shown by experimentation.

Dr. Howe has conducted an important series of observations upon the variability in composition of the saliva and the relationship of this variability to metabolism and semeiology.

In his study of "Dietetics with Relation to Salivary Composition" (Dental Cosmos, January 1911), he says:

> In the conduct of the work, notes were made upon the character and amount of food taken by the subject under examination. Clinical observations were recorded of his physiological condition and his anatomical characteristics. This was supplemented by some very general salivary analyses. Inquiry was made as to—
>
> > The amount of food—for comparison with the standards of intake and output that have been evolved in the laboratories at Yale University, viz, 60 grams protein, and 1500 to 2500 calories for a normal individual weighing 70 kilos and under ordinary work.

The character of the food—as to its bulk, coarseness, effect upon digestive secretions (stimulant or depressant), and its fermentability as opposed to its putrescence. The bearing of this is extremely important in regard to intestinal toxemias, to digestive activity or to stasis.

Habits of life, sedentary or active. Exercise in the open air—with reference to the complete oxidation of foods.

Nervousness—with respect to the perfection of the physiological process concerned with metabolism.

General appearance—for the detection of pathological states and for perfection of anatomical formation. My studies compel me to believe that the narrow protruded arch, adenoid and tonsillar affections, are indicative of nutritional defects. (Compare cretins and cases of osteomalacia.)

This work shows that salivary composition is markedly influenced by these factors. In the case of intestinal crises I have many times found indican in the saliva. During toxemias, sialorrhea is a very constant accompaniment, as well as during some febrile states when it comes on in an effort on the part of the system to eliminate the toxins.

It is not difficult to see that when the dietetic principles become distorted to such an extent that pathological conditions ensue, then caries is most active.

Further experimentation was carried out to show the connection between dietetics and salivary composition by dieting several individuals for a number of days, first on a considerable excess of protein, and later on an excess of carbohydrate material. Analysis of the saliva was made with a view to ascertaining if imperfect or partially oxidized metabolites were present.

In the case of excessive protein feeding, the general alkalinity of the saliva was lowered. The reaction of the saliva which was allowed to ferment was alkaline, with the formation of ill-smelling gases. This indicated sulfates and ammoniacal products. In certain cases urea was shown to be present by the Doremus test.

In the case of excessive carbohydrate feeding, the general alkalinity of the saliva was also lowered. In some cases it was acid after boiling. Certain cases gave evidence of sugar or its homologs by causing reductions, with mirror formation, as shown by Tollen's test. These salivas fermented, became acid, or became reduced to an alcohol as shown by the iodoform test. This is still further proof of the presence of fermentable carbohydrate material. This saliva showed no signs of putrescence after it had been kept for weeks.

It is concluded, then, that the lessened alkalinity of these salivas is indicative of impeded oxidations throughout the system; for complete oxidations mean CO_2 in the case of carbohydrates, and CO_2 and ammonia in the case of proteins.

It is further concluded that food substances when taken in excess of physiological requirements become excretory products and are to be found in one form or another in the saliva.

In another series of experiments I have emphasized and demonstrated the fact that the salivary glands are secretory channels by taking *per os* many medicinal substances in capsules, and have shown that these substances are to be detected in the saliva in from fifteen to twenty minutes. Their presence is to be detected for about fifteen hours. Bromids, iodids, iron, KCNS, salicylic acid, and other substances, are to be included in the list of medicaments tried.

Pathological substances formed within the system are excreted in the same way, as has been already stated. So that it may be seen how elements for or against bacterial proliferation find their way into the mouth from other parts of the system.

Dr. Howe has also contributed an important communication upon the devices and tests used in his salivary work. (DENTAL COSMOS, January 1913.) I add here his report upon that phase of the subject as follows:

The refinement of analytical work upon the saliva has created a demand for an equipment adapted to the work.

First as to suitable apparatus, and next as to appropriate volumetric tests.

One of the most indispensable things that I have originated and use in my work is an apparatus for collecting saliva directly from the several glands. Illustrations of these instruments are to be found in the DENTAL COSMOS, although since their publication I have improved and added to the appliances.

One consists of a glass aspirator, with a bell-shaped mouthpiece to inclose the orifice of the duct from the parotid gland and a reservoir for holding the saliva. The aspiration is controlled by a rubber bulb. In use this is placed over Steno's duct, just enough aspiration produced to hold the instrument in place, and food eaten to incite the flow. The rate of flow is noted, and the saliva collected absolutely uncontaminated with extraneous material.

A similar device is used on the duct of Wharton. Here both duct outlets are covered with the bell on account of the close proximity of the two ducts.

Still another collector with a suitable piece of soft rubber is used, covering as closely as possible the entire glandular outlets of the sublingual glands as well as those of the submaxillary glands.

Other devices such as are to be found in any well-equipped laboratory I have had made smaller or altered for the work in hand, such as pycnometers, suction filters, funnels, Gooch filters, extraction and distillation apparatus, viscosimeters, and many other similar things.

The tests I employ are such as are used in the best physiological laboratories, and that are appropriate for work upon the saliva and capable of detecting very small quantities of the substance sought.

Dr. Howe has furnished me for this report the following record of the conclusions he has reached from his own investigations of the saliva thus far, which seem to be quite in accord with the views and conclusions reached by the late Joseph Porter Michaels of Paris:

The saliva is individual in character. It reflects the physiological actions of the system, and its constituents are controlled by the same set of organs, by the same nerve centers, and by the same metabolic principles that control these elements throughout the body. Alterations in its character occur only in accordance with definite physiological principles.

Under stimulation its character is changed, depending upon alterations that occur in the O and CO_2 relations with the gland, as shown by Barcroft, and set forth in Starling ("Physiology of Digestion").

Pain causes a very alkaline saliva.

Even under stimulation, the saliva maintains its individuality as may readily be seen by using the same stimulus to incite the flow and making comparative analyses.

The constituents of the saliva maintain a definite relation to one another—the Na to the K, the Ca to the Mg, the albumin to the globulin in parotid saliva. From the few analyses that I have made in cases of systemic derangement, I feel that these proportions are subject to the same alteration that occurs in other parts of the body during the same derangement.

Morbid and excretory products are to be found in the saliva—for example, indican may be readily found during crises of intestinal fermentation. Urea, sulfates, KCNS, may be classed among the excretory substances. Such substances as iodids, bromids, iron, KCNS, taken in capsules by way of the stomach can be detected in the saliva in fifteen minutes after taking.

During feeding experiments in which carbohydrates were taken for a number of days in excess of physiological requirements, evidences of imperfectly oxidized metabolites were to be obtained, and during an induced glycosuria marked reduction action occurred with Tollen's test, indicative of the presence of glucose, or an aldehyd.

Evidences were obtained of imperfect oxidation of protein substances in experiments in which excessive protein diet was maintained for some days. Other substances that I have been able to determine by positive tests are creatinin and cholestrol.

So that it may be seen that excretory substances, morbid substances, and partially oxidized metabolites are thrown directly into the mouth by way of the saliva.

From many estimations and some balances carried out, it may be generally stated that the saliva is composed of—

Carbonate and phosphate of calcium and magnesium.
Chlorids of sodium and potassium.
Phosphates " " "
Mucin.
Serum and albumin and globulin.
Lecithin.
Other fats.

One other property of the saliva is its colloidal absorption property, and its effect on holding in solution the calcium salts beyond the usual solubility point, even after the removal of the CO_2.

Dr. Henry C. Ferris, of New York, who has for years given sympathetic attention to the study of the physical and chemical characteristics of the saliva, has furnished me with a *résumé* of his own work, as follows:

Desiring to study the pathological condition of the oral cavity, I was impressed with the small amount of technical information upon which to proceed, and a further lack of information as to the normal physiological properties of the salivary secretion. Before studying the pathological field, therefore, it was necessary to develop a technique that might establish the normal within physiological limits.

In an effort to develop a technique that would be practical for diagnosis, my first obstacle arose from the fact that 20 cc. was all that could be delivered by an individual within a reasonable time; therefore, instruments had to be constructed that would give readings with a small quantity of specimen. This was experimented upon until I was able to report twenty findings with this quantity of specimen, namely: Quantity of flow per minute, specific gravity, viscidity, enzymic index, proteolytic test, oxydase, free acidity to phenol-phthalein, combined acidity to phenol-phthalein and aldehyd, alkalinity to methyl orange, amino-acids as ammonia, centrifuged precipitates, globulin, Purdy albumin, thiocyanates, chlorin, urea, potassium base, sodium base, total solids and ash.

The technique adopted for determining the length of time for delivery needed careful consideration of the psychic influences and the reflexes due to the excitation of the optic, auditory, and olfactory centers, as reported by Professor Pavlov, in his work on "The Secretory Glands," recently published; therefore the patient was given a book to read and placed by himself in a room which was moderately illuminated, and free from any disturbing noises or odor of cooking food, and then instructed to expectorate (without exercise of the muscles of mastication or contact of the teeth) 20 cc. into a white porcelain cup, as fast as the saliva flowed. An opaque cup was found to be necessary owing to the effects upon the sensibility of some patients of observing the specimen in a clear glass vessel, which had the effect of retarding the flow of these sensitive individuals.

The time of delivery of 20 cc. at a given hour in the day, bears a relation to the consumption of water or the fluidity of the blood, "within physiological limits," as a varying diet will have an influence upon this finding, but with control of the diet I have found this factor to be of diagnostic value, particularly in acute pathological conditions.

In determining the specific gravity, it was found that a modification of a Soxhlet hydrometer was the most practical instrument, as the specific gravity of 2½ cc. could be attained. This was particularly valuable in the analysis of specimens of children under four years of age, when 4 cc. was all that could be obtained, and also in diabetic patients.

The viscidity is difficult to obtain, and the findings are the least accurate of any that are secured in this technical procedure, owing to the fact that the atmospheric conditions have a great influence over this property, as well as the enzymes and the bacteria when the specimen is exposed to the air. In want of a perfect instrument, a crude method, as illustrated in the report of the National Dental Association of America in 1911, was found to be as satisfactory for diagnostic purposes as any. The viscidity varied greatly in the time of day that the specimen was delivered, but seemed at 11 A.M. to be the most constant in the normal subject. The early hours gave the highest findings with a decreasing scale.

It is my belief that more complete information upon the physiological properties of this material and the effect of the nerve reflexes, is of the greatest importance in the solving of this problem.

To determine the enzymic index I adopted the method proposed by Glinski and Walther, as being considered by Professor Pavlov to be the most accurate method of determining the value of this enzyme, and it has proved to be very valuable in determining the ability of the patient to digest starch, and seemed to bear a relation to the total acidity of the specimen, also to the functioning ability of the teeth.

The proteolytic ferments, while appearing in small quantities, were yet proved to be markedly present in the normal specimen, particularly those patients who were large consumers of meat.

While there is a ferment oxydase present in the normal specimen, its presence is detectable only by color reaction, and is very delicate. It is minus in cases with lesions of the oral cavity or general febrile conditions.

In determining the acidity by titration with phenol-phthalein as an indicator, we find this latter to be sensitive to CO_2, and as the gas in the exhaled breath has been shown to vary from 5.3 to 5.7 per cent. we may reasonably feel that these findings are inaccurate as representing true acidity, but repeated tests from the same subject in the same day, and again in successive days at the same hour, show variations within physiological limits and prove to be of value in diagnosing general disorders, and bear a relation to the enzymic value, particularly when the total acidity is taken. When amino-acids are calculated as ammonia, they seem to bear a relation to the chlorin; when the former is high the latter is low, and *vice versa*.

I have used a centrifuge method for determining the precipitates; this, according to some writers in the biological field, is obsolete, but I find it to be helpful in determining the general physical condition of the system. Specimens free from food particles give very

uniform readings, and when Purdy albumin is present are diagnostic of pathological states.

The thiocyanate content of the saliva, over which considerable controversy has occurred, I believe to be important, and from my records such presence is indicative of normal states.

The presence of urea in large quantities is decidedly diagnostic, as it is in the urine.

Potassium and sodium bases, when compared, will often assist the physician when directing diet and in the administration of drugs.

In closing, I can say that by this means I have been able in a number of cases to aid physicians in constitutional treatment, which has resulted in cures—when other methods of diagnosis have failed, and I am firmly convinced that this active fluid or secretion of the body, so easily obtained, will eventually be proved to give more diagnostic information to the student of pathology than is now obtained from the analysis of the excreta or waste products of the body.

The republication in America of the contributions made by the late Dr. Joseph Porter Michaels of Paris, aroused a widespread interest in America in the study of the saliva. The pioneer work of Miller, Leon Williams, and Black on the subject of dental caries had already justified the conclusion that the causes which originate dental caries were to be sought in the environment of the teeth and not in the teeth themselves. The emphasis which the work of Michaels placed upon the idea that the saliva was of constantly varying composition, not only as between individuals, but variable in composition in the same individual at different times, strongly suggested that light upon the unsolved problem of immunity and susceptibility to dental caries could be most hopefully sought for in an investigation of the relationship of the salivary fluids to the etiology of dental caries. Moreover, the dictum of Michaels that salivary composition is a reflex of metabolism at a given time, and therefore an index of the bodily state of even greater significance than the composition of the blood or urine, has aroused a general interest in the subject of saliva study and stimulated research to a degree which is most encouraging, and which will doubtless continue until satisfactory results have been obtained.

Without minimizing the importance of the work already accomplished both as to results and magnitude of labor involved, it is evident that what has been accomplished is but meager in comparison with that which needs to be done. But it is equally true that what has been accomplished furnishes abundant evidence of the extreme importance of the general question of salivary composition, and it cannot be doubted that the recognition of that fact is ample guarantee that the work of salivary investigation will proceed with increasing enthusiasm and larger results in the future.

RELATIONS OF DENTAL AND RHINOLOGIC WORK.

By R. R. DALY, M.D., Atlanta, Ga.

THE physical connection between the fields of dentistry and rhinology is so close as to need no description; nevertheless we have dissociated the two areas involved by the use of the words until we find ourselves thinking absurdly about their related functions.

Terminology, after all, is a decisive factor, and our concepts of the relations of the ailments which the dentist and the rhinologist respectively treat are qualified by even greater separation than possibly the distance between their offices.

THE PUBLIC'S ATTITUDE TOWARD THE DENTIST AND THE RHINOLOGIST RESPECTIVELY.

In the minds of many of the intelligent laity, these two sets of workers are hardly acquainted with each other, and they can never come close enough to clash. There is one bond uniting us, and yet we resent it. Some of our best patrons, when we attempt to secure histories from them or to advise them as to general hygiene, decline to answer or to be advised, because the speaker is "only a dentist," or "only a throat specialist." They do not realize that, as doctors, we are teachers, and teachers for their own good.

My diploma is written in Latin, unfortunately. It is very impressive on that account to some of my patients, but it is not convincing that I am a *doctor* in the true sense. We all, therefore, are classed among the "onlys"; our *ex cathedra* utterances, no matter how solemn, are never accorded their full meed of respect, and they are often received with so many grains of salt as to make them seem almost salacious.

Fortunately, we are accustomed to standing upon our feet, and to having the world below us. We can see and enjoy its humor, and make the most of its foibles.

CO-OPERATION ESSENTIAL.

We can smile indulgently upon the surprise manifested at the wisdom we display, for gradually we are becoming leaders in the great art of healing, and the people are learning to turn for advice to those men who make a study of the diseases of the head and neck. The vast majority of the diseases that burden humanity, leaving aside the venereal, have their origin in or gain entrance through the facial openings, and we are showing that when these orifices and the organs directly within them are put in good order and kept so, the longevity of the race is increased and much is added to the stock of human happiness.

This should and does make us content to get together and do our work, every group correlating its special endeavor with that of every other, and each yielding mutual assistance.

IMPORTANCE OF ORAL HYGIENE IN THE TREATMENT OF TUBERCULOSIS.

My experience with the treatment of tuberculosis in the public clinic of Atlanta proves beyond a peradventure that a cure of this disease cannot be effected unless the teeth are in good order. I have treated case after case of tubercular laryngitis, with apparent success so far as the ulcers were concerned, only to have recurrences almost as rapidly as the patient could return, when the crux of the matter was the foul teeth. A thorough cleansing of the teeth removed the filth so familiar to all of us, changed the character of the buccal secretions from being irritating solutions to such as were nearly normal, and permitted the laryngo-mucous membranes to fight their battle unhandicapped. Moreover, cases in which the foci were all in the lung, and in which supremacy in the battle for life hung upon the aid obtainable from nourishing food, died when the teeth were bad, or recovered when the food was subjected to normal mastication and entered the stomach unpoisoned and in a condition fit for digestion.

I would no more attempt to treat tuberculosis today without the aid of a dentist than without the assistance of good food and fresh air. A set of dirty teeth, even if there is no pyorrhea present, will undo or prevent all the gain the other methods will induce. On the other hand, when the teeth are in bad condition, and nutrition is manifestly interfered with, the observing dentist is in a position to warn the patient as to the dangers threatened by numerous infections, tuberculosis included. Just how this disease is contracted is not definitely proved. We are taught to believe that it is almost entirely an inhalation disease; yet such an able investigator as Dr. Thrash of Atlanta has attracted wide attention to his thesis, which seeks to show that it is primarily through the

alimentary tract that the germs find their way. But whatever may be the avenue, the disease progresses or subsides according to the amount of bodily resistance which it meets. A foul mouth means lowered resistance.

This is true, of course, of any infectious disease, but tuberculosis is the one scourge which is always with us, and constantly presents new problems for us to solve.

NORMAL BREATHING AND THE SHAPE OF THE PALATAL ARCH.

The problems of normal breathing and the shape of the palatal arch present themselves to us simultaneously. The dentist has children come to him with high arches and beginning curvature of the nasal septa, tonsils and adenoids interfering with nasal breathing so as to prevent the tongue from exerting its normal pressure upon the developing arch. The rhinologist has patients presenting themselves who have twisted septa with high arches that he cannot reduce, and others who continue to be mouth-breathers after the respiratory passages are clear, because the jaws do not occlude properly. It does not do for the practitioner of either profession to say to the parents that he has done his part, and that if the child does not breathe well it is not the rhinologist's or the dentist's fault. The child came in the first instance to be cured and be restored to normal, so that it would grow to strong adult life. It is the child and the child alone who is to be considered, and we must see to it that we work together to bring about this result.

It is a waste of time in this day of great mechanical skill to tell parents to let the child outgrow any deformity. There never was a deformity outgrown yet. I defy any man to show me one case where nature unaided has corrected it. It is for us to judge among ourselves after an intelligent combined study of cases as to how much aid is needed.

Will the little septum which is beginning to deviate and to obstruct a nostril so that the child cannot use one side of the nose to its functional limit—will that septum become straight if the upper jaws are pressed apart? Or must we operate early upon the septum itself in order to prevent asthma and lack of nutrition? There is no question that the nares should be free and open so that the turbinates may do their work; but who is to perform the operation, the dentist or the laryngologist? How can we find out, unless we are in closest touch and working together? There are thousands of children in town, and some of them seem to be in the way, but there is not one to be treated thoughtlessly, not one upon whom an unnecessary operation should be performed.

When, after removal of tonsils and adenoids and a careful clearance of the breathing tract, the mouth continues to stay open at night because the jaws still do not occlude accurately, or because the arch is high, who shall say what is to be done but the man who knows whether the increased pressure of the released tongue will adjust those jaws, or whether apparatus must be introduced?

I can never feel satisfied with such cases until they have been examined by the dentist. I cannot induce them all to go, because the people are not yet educated as to this important matter, but I am trying in every case to have the benefit of expert opinion, and to give the child all the chances which we as the custodians of science have to offer.

CHRONIC OR RECURRENT PHARYNGITIS.

This disease or symptom is a common one among adults in our practice, and its cause is often difficult to find; it may be due to troubles situated higher in the breathing tract, or to smoking or chewing. Among the poorer people it is often due to snuff. But more than all else, in my experience, it is due to diseased teeth and gums. This disease may appear in what seem to be the cleanest of mouths, but whenever bridge work or crowns of any character are present, I begin to hunt for troubles in the saliva. This may sound like a wholesale indictment of all such work. I do not mean to

condemn such work, but the dentist knows best himself what may occur at the cervical margin of a crown which cannot, in the nature of things, be fitted absolutely correctly to the abutment, or what may occur beneath a bridge where the dental floss will not reach.

POSSIBLE SOURCES OF FETID BREATH.

Food lodges and decays there, producing an acid reaction, until the saliva is so changed that it irritates the oral tissue, causes more or less foul breath, and produces a pharyngeal condition which attracts the attention of the wrong man. It is a dental proposition pure and simple. This all may sound elementary, and I would not speak of such conditions were they not presented to me so frequently as to warrant attention. No one of us is sufficiently expert always to see all that he is looking at. It is the little things, the things that we think we ought to know as a matter of course, that we really overlook while we are searching for the abstruse or that which only the specially trained eye can see.

One little factor that comes to my assistance is empiric, but it is accurate enough for its purpose, and that is the odor of the saliva. I get it on my tongue depressor, and from it I judge largely what to look for. This odor indicates to me the presence of decayed food and of pus, and it is quite different from that of acute infection of the pharynx. It tells me whether I have to consider the need of dental assistance, and whether the fetor of the breath is of gastric, pharyngeal, or dental origin.

Incidentally, it is well to remember that any instrument used in the mouth and allowed to lie on the table for two or three minutes while another instrument is being used, will have a bad odor even from clean saliva. When a mirror is warmed in a flame or over a lamp, as with laryngologists, the odor will go far to cause gagging, unless all the saliva has been removed. Incidentally, there is only one good method of removing saliva or any other dirt from instruments, and that is the use of soap and running water. I do not like a tray of antiseptic or of boiling water too close at hand. The cooked or the poisoned germs may not be so very harmful, but I do not like the idea of having them put in my mouth or in that of any patient.

THE MAXILLARY ANTRUM, AND ITS TREATMENT.

The antrum is our bugbear, and in serious conditions thereof we have our decided differences of opinion and method of procedure.

In the great majority of my own cases diseased conditions of the antrum are serious because they are a bugbear. In my judgment antral disease is not a dental problem at all. Of course there are exceptional cases in which the whole alveolus has been injured, or malignant disease exists, but these do not concern us at present. The accidental perforation of the antrum in ordinary dental work is of little consequence, if it is allowed to heal promptly and without attention. Even if there is antral irritation, it should be allowed to heal, and the buccal opening should be closed. I have never seen a case of antral trouble get well when there was communication with the mouth. Antral sinusitis is a nasal proposition, and drainage through the nose is the only successful method of treatment.

Barring malignant disease, if reasonable drainage through the nose is established, and the antrum is kept free from irritating fluids—such as saliva and a lot of antiseptics—it will recover. I have several cases of recovery to my credit in which I have done nothing in the way of treatment. The defenceless mucous membrane lining the antrum was simply crying out for a rest, and its real needs had not been recognized.

I am not even making as many punctures underneath the inferior turbinate as I used to. Since I have learned to pack the nares with soft pledgets saturated with argyrol, I have found that I can apply enough of the gentle antiseptic to remain for two or three days,

these dressings being inserted over the normal opening without pain or distress. The proof that the antiseptic reached the antrum lies in the fact that it continues to come out and stain the handkerchief on the third day.

The dentist is to determine whether a tooth is causing the pain that radiates through the side of the face, or whether this pain is due to some other cause. Then the rhinologist is to ascertain whether there is indication of primary antral inflammation. A little combined observation sets both these observers on the right track, and the patient gets the benefit of speedy relief without experimentation in each instance. Will not our credit as good workers increase enough to pay us for the trouble?

CONJUNCTIVITIS.

The subject of conjunctivitis takes us at a leap into a new field, but my experience shows that it is correlated to the mouth and naso-pharynx.

I have had children suffering with persistent conjunctivitis which seemed to be a constantly recurring infection rather than a chronic condition. It took me a long time to learn to see what I was looking at, and realize that the source of infection was a dirty mouth. We have learned to associate conjunctivitis with tonsillitis in children because they often occur together, possibly owing to the same extraneous infection, possibly because of the lowered resistance, and possibly owing to infection which the fingers carry from the mouth to the eye. I have learned that when a dirty mouth and continuous conjunctivitis are associated, the mouth must be cleaned before the eyes will get well.

HEADACHE.

Perhaps the most troublesome cases come to us for the relief of headache. The people have learned that headache often indicates eye-strain and come to us on that account. That is easy to determine, but in a large percentage of cases some other cause must be looked for. It is our duty, then, to determine the etiology of the trouble. But here again I often meet with the public's reluctant attitude spoken of before. For when I begin to make further search into the disturbed physiology of the patient, I am met with rebuff until I have translated my Latin diploma and perhaps shown my registration certificate. The wonder is that we do not lose patience, but the problem is interesting, and the sufferer is there for relief, not for words or labels.

A TYPICAL CASE.

I will relate one case which shows the complexity of interrelations. Headache was the first symptom complained of; it was not due to the eyes. Then there was complaint of stomach pains, loss of appetite, etc. This was followed by pains in the joints, sleeplessness, bad dreams, bad breath, ideas of poisoned food, and a dozen other indications of hypochondria or manic-depressive insanity. Perhaps it would have been well to stop after this diagnosis, and let the label carry the responsibility to someone else, but no relief had been granted, and that was sought.

The combination of these symptoms pointed to the mouth, and there the search was made. The saliva had a bad odor, especially when the least heat was applied. There were several crowns and considerable bridge work, all seemingly well done. To the ordinary observer the gums looked fairly healthy, and the patient was manifestly tidy with the brush.

But expert examination showed pyorrhea alveolaris in over a dozen teeth, and dental care was at once instituted as the only means of relief. The urine was loaded with indican, and there was a general toxic condition that accounted for all the other symptoms. Subsequent recovery relieved us from further search.

TUBE TEETH AND PORCELAIN RODS: THEIR USES AND ADAPTATIONS IN PROSTHETIC DENTISTRY.

By JOHN GIRDWOOD, D.D.S.Univ.Pa., L.D.S.Edin., Edinburgh, Scotland.

(Continued from vol. lvi, page 1344.)

(IX.)

CHAPTER XI.—The Use of Tube Teeth in Plate Work.

In dealing with this subject no consideration will be given to the construction of metal plates, but attention directed at once to the fitting of tube teeth, and it is to be understood that struck plates are here referred to.

Assuming the case to be that of an upper where the third molars and canines alone are left standing, and that the amount of absorption is such that the case could be satisfactorily dealt with by the use of plain teeth, suitable teeth should be chosen for the incisors, care being taken that they are long enough and of the right width to fill the space. The color, however, is the most important matter, as it will be seen from what has already been said in connection with the subject of shaping and grinding, that teeth of whatever size, provided they are large enough and of the right color, can be shaped to the requirements of any case. The first step after having chosen the teeth is to rough-fit the two central incisors to the plate, and having removed all débris from the tubes and melted a thin layer of wax on to the front of the plate, the two incisors should be slightly heated and carefully stuck in position (Fig. 153); the marker (Fig. 154) should then be passed down the tube of each tooth in turn, and the point pressed into the plate, while the instrument is being rotated. While doing so the teeth should be firmly held in place with the forefinger and thumb of the left hand, so as to steady them and prevent their position from being altered. Another way of marking the pins is to touch the end of a marker with vermilion paint, and for this purpose a piece of pin-wire tapered and rounded at the point answers well. This should be passed down through the tube, where of course it will show a red point on the plate. The operator being satisfied that the position of each pin has been duly marked, the teeth should be removed from the plate by slightly heating it over a Bunsen flame and clearing away all traces of wax from plate and teeth. Having replaced the plate upon the model, hold it firmly in position with the left hand, while resting the model against the bench-block, and with the graver deepen the marks previously made. The holes for the pins should next be drilled, and in order to do this use a drill a size smaller than the pin wire. Pliers are sold for the purpose of punching these holes, but they should not be used, especially by the inexperienced, as their use involves a danger of bending the plate. When the pinhole has to be made on a steeply sloping part of the plate and not on the top of the ridge, considerable care and skill are required to prevent fixing the position of the pin too far down on the slope. In order to avoid this a good plan is to use a small drill, and afterward enlarge the hole for

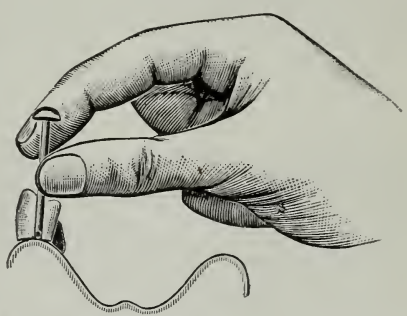
the pin by means of the broach, using the tooth as a guide. The broach used should be either a size smaller at its thickest part than the pin wire, or have a mark made on it to indicate the point beyond which it cannot be used without danger of making the hole too large or of splitting the tooth. The bur made by the drill and broach should be removed by the scraper or graver, and the pinhole slightly countersunk on the palatal surface. A length of pin wire is now taken

Fig. 153.

Shows centrals stuck on plate, ready for position of pins to be marked.

and passed through the tooth, and a piece a little longer than the tube cut off with the cutting pliers. Next grasp the pin with a pair of roughing pliers, file the end of it to a three or four-sided shape, and slightly taper it to enable it to hold firmly in the hole during the soldering process. All pins should be prepared in this way and placed on the bench, each one opposite its corresponding tooth. The pinholes are now painted with borax, as well as the pins. Grasp each pin with the roughing pliers, and firmly force it into the pinhole in the plate, taking care to give it the right direction—and until much experience has been gained it is best to solder not more than two to four pins at one time, but the experienced workman will have little difficulty in soldering as many pins as may be required at once. Having satisfactorily fixed the pins in place, proceed to solder them in the following way: Place a small piece of solder on the plate, touching each pin; then place the plate on the soldering block, or on a good-sized piece of asbestos fiber, where it will rest steadily, taking care that the pin or pins to be soldered are in a vertical position. Now heat up the plate

Fig. 154.



Method of marking position of each tooth.

carefully and slowly with the blowpipe, so that the borax in fusing does not displace the solder. The plate must be heated-up until the solder flows, and should it be found on examination of the palatal surface that the solder has not flowed through, heat up the plate thoroughly, center the flame on to the ends of the pins on the palatal surface, and carefully draw the solder through. In soldering the pins to the plate, a lower grade of solder may be employed than has been used in any other part of the work, because this is usually the last soldering that requires to be done, except the case is one in which flat teeth have been used, when they are generally soldered last, and pins for the tube teeth are protected by investment. It is a matter of considerable importance to have the pieces of solder of the right size. Too much solder will interfere with letting the tooth down over it, and have to be cut away, while too little will leave the attachment of the pins to

the plate too weak. The correct amount should be sufficient to solder the pin to the plate and surround it on its lingual surface with a slightly beveled collar, which will add to its strength. The beginner invariably errs in using too much rather than too little solder.

The plate should now be boiled in pickle to remove the borax, and any excess of solder or slight projection of the pin on the palatal surface should be cut off with a half-round graver, or ground off with a small stone so that the plate may go home to place on the model. The teeth should now be tried on the pins to insure that their direction is right, as

Fig. 155.

Central fitted to gum with plate cut away.

during the soldering process this may have been slightly altered. But if that end of the pin attached to the plate is right, any alteration which may have taken place in the soldering can only affect its direction, and this may be rectified by grasping the pin with the pin-bender or a pair of pliers close to the surface of the plate, while it is held firmly on the model, so bending it into line.

There are other methods employed of uniting the pins to the plate, such as investing and then soldering, or tying them to place with binding wire. The method given is, however, the simplest, and yields entirely satisfactory results.

Having got the pins soldered, the teeth are to be tried until it has been ascertained that they are correctly placed. Slight bending may be required to adjust them satisfactorily. Their free ends may now be cut down to the bite, and any excess of solder around the base of the pins which might prevent the teeth from getting home should be cut away, but if the correct quantity of solder has been used this will not be necessary. The steel countersink may now be used to countersink the base of the platinum tube tooth, or this may be done with a Butler's point in the case of a non-platinum tube tooth. The two tube centrals should now be let farther down to fit the plate, and the lateral incisors treated in precisely the same way as the centrals. If the teeth are to be set on the gum and not on the plate, the latter should be cut away as in Fig. 155, allowing the porcelain to project about one-sixteenth of an inch beyond the edge of the gold. Unless the teeth are too narrow in the base, this will not interfere with the strength of the attachment between the pin and the plate. The teeth should be ground in the manner described in connection with fitting tube crowns, until they accurately fit the plate, and their cervico-labial margins are adapted in like manner to the model, the operator taking care in doing so to note that they are left of a proper length and made to conform to the bite, while the pins are at the same time filed or ground flush with the lingual surface of the teeth. The teeth cannot be considered as fitted until there is not the slightest visible space between them and the plate. In fact, the gold should appear as if it were cast on to the tooth. Accuracy with regard to the fit of the teeth to the plate not only shows workmanlike skill, but has the practical advantage of lessening the risk of the rotary motion of the jaw loosening the teeth, a possible accident which might occur if they are not steady on the pins.

After the pins have been soldered to the plate, and the fitting of the teeth is being proceeded with, one or more of them may be found to "bind" as they touch each other, and this will necessitate a little of the contour being ground off; or the reverse may be the case, and some of the teeth may not touch, and

adjustment of the pins will be required to obtain points of contact.

Having fine-fitted the teeth to the plate, their ground edges will be a little rough, and these should be smoothed off

FIG. 156.

Model showing case suitable for bridge, while patient preferred plate. Canine devitalized; cap and tube shown in place. Molar with gold inlay hollowed out to accommodate spur on plate.

by slightly touching them against the sides of a fine and fast-running wheel.

The fitting of the grinding teeth should be carried out in the same manner as already described in connection with

FIG. 157.

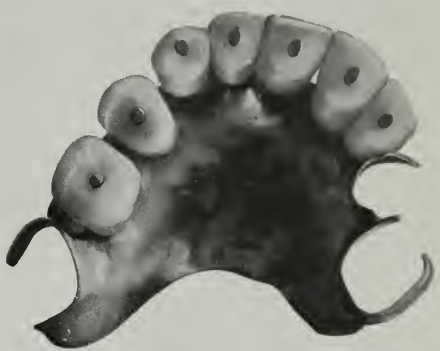
Small gold plate with three tube bicuspids, pin attached to plate to enter canine tube. (Pin not shown in illustration.)

the incisors, but some operators prefer to have them touch along their approximal surface from the plate to the grinding surface, as thereby particles of food do not easily lodge between them, and there is much to be said in favor of this method.

FIG. 158.

Partial upper gold plate with tube teeth; labial view.

FIG. 159.



Lingual view of plate in preceding illustration.

FIG. 160.

Partial lower gold plate.

When a tube tooth has to be fitted against a clasp, it is well to reduce it to nearly its proper length before grinding off the side to fit the clasp, and only

about half of what will require to be ground off should be removed before the pin is soldered to the plate. Further, in marking the position for the pin, the base of the tooth should be held close up to the clasp at its neck, unless it be a type of tube tooth much contracted at the neck, as some tube bicuspids are. This will incline the tooth a little away from the clasped one. After the pin has been soldered to the plate, the former should be bent slightly toward the clasped tooth, when it will be found that the tooth will not go home to place, but press against the clasp. Mark where it rests, and grind carefully away, taking care not to grind away from the neck of the tooth but toward it. Bend the post still farther toward the clasped tooth, and repeat the process of grinding and bending the post until the tooth is in proper line, when it will be found to lie closely against the clasp. (Figs. 156 to 160.)

Double-tubed Rods.

The use of double-tubed rods has been dealt with in treating of crown work, and the advantages claimed for them in that connection apply also in certain cases of plate work. The class of case most suitable for their use is where the bite is abnormally close. The method of fitting them is in all respects similar to that already described in connection with single-tube teeth or tube rods, and the only point which calls for special mention is the method of fixing the pins to the plate. There are two methods whereby this may be done, and that which calls for the least amount of skill and which yields the desired results with very little labor will be first described. After the block has been fitted and cut off to the required length, it should be fixed in position on the plate by means of sticky-wax, the position of the pin determined as before described, the hole drilled, and the pin soldered, the pin nearest the front being the first to be soldered. If by chance the position of the porcelain block should be found to be a trifle too far away from the tooth anterior to it after the post has been soldered, this can easily be remedied by cutting off the pin and resoldering a fresh one. If, on the other hand, it should be a trifle too close to the adjoining tooth or space, sufficient of the excess can be ground off; but with ordinary care such a mishap should be impossible. Special care should be observed to make certain that the direction of the first pin is correct, and that it has been given the necessary inclination toward the center line in the case of the upper, and in the lower placed vertically, as it is important that no subsequent bending of the pin should be necessary. Having now fixed the first pin satisfactorily, the second or posterior pin is adjusted, as in the case of a single tooth.

The second method is to adjust and solder both pins at once, and while this is very easily done, it requires more care and skill than the method already described. The block is to be fixed as before, and the position of both pins carefully marked on the plate. The pin for the first should be firmly fixed by forcing it to place with the roughing-pliers, or a temporary pin employed, and the hole for the second one enlarged with the broach passed through the tube, which thus acts as a guide. Having prepared the posts and their sockets, adjust them so that the block can be slipped off and on readily, then solder them without investing.

The subsequent steps are the same as those already described in crown work.

Repairs in Plate Work.

The repairing of a gold plate with tube teeth is an easier matter than where the teeth are soldered, as the teeth, being usually fixed on with sulfur, can be easily removed,* and in consequence the danger of fracture while soldering is obviated, while at the same time the investment can be much more quickly heated up, and in certain cases can be dispensed with altogether. In cases of

* This subject will be dealt with in a subsequent paper.

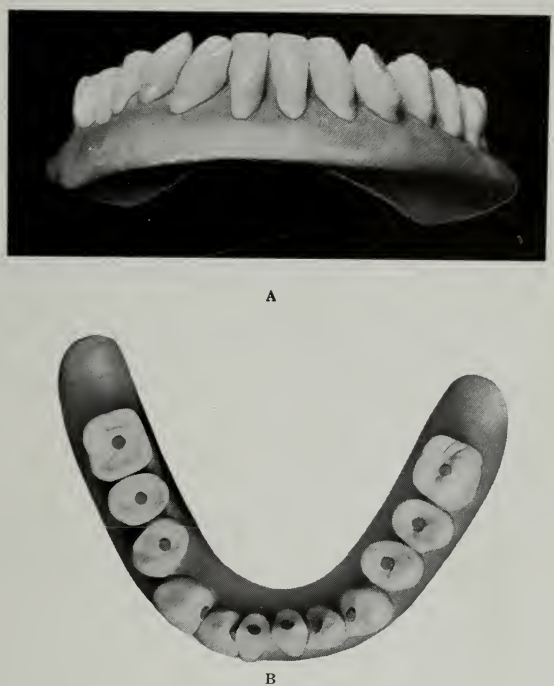
close bite and where there are several detached teeth, tube teeth are peculiarly well suited, for the above reasons, as well as for others stated elsewhere.

In the case of replacement of a broken tooth only, the procedure is similar to that of fitting a tube tooth as described in "Crown Work," Chapter IX.

apparent to those who have followed the arguments advanced in their favor, and it is therefore unnecessary to elaborate these further, though additional confirmation may be obtained from the accompanying illustrations.

With regard to the selection of suitable teeth, this presents fewer difficulties

FIG. 161.



A

B

Lower vulcanite plate with tube teeth. A, Front view. B, Incisive view.

CHAPTER XII.—THE USE OF TUBE TEETH, GUM TUBE TEETH, AND SECTIONS IN VULCANITE WORK.

In dealing with this subject the writer proposes to describe briefly the use of the above-named teeth in connection with vulcanite as a base, as well as combination dentures, which include metal plates —usually gold—with vulcanite attachments, vulcanite plates with metal linings, etc. The suitability of these teeth for use in the above manner will be

than in the case of ordinary plain teeth, or indeed of teeth of any other type, for various reasons, one of which is that the method of attachment permits of much greater amount being ground off without the danger of impairing or destroying the anchorage.

The method employed in arranging tube teeth is similar to that followed in connection with other forms. They have, however, this advantage, that they allow of greater freedom in the matter of arrangement than plain teeth, for the

reason that they can be set at a greater angle to one another without the risk of showing vulcanite, and so obtain the advantage possessed by teeth which do not require a vulcanite or metal backing (Fig. 161), their closest rivals in this respect being countersunk teeth. The teeth are set up in the usual way, but before the case is flasked the tubes should be filled with wax, in order to prevent plaster from flowing into them while the case is being invested. Fig. 162 shows an upper case ready for packing, and before doing so suitable posts (Fig. 163), such as those supplied by

Fig. 162.

Upper case ready for packing.

Messrs. Ash of London,* should be cut to the proper length and fitted to the tubes. Before fixing them in place small pieces of rubber should be packed into the tubes and the posts slightly heated, and pressed home to place: this insures the posts being covered with rubber, and a secure attachment being obtained.

The foregoing is the method employed in most cases, but certain conditions may exist which will necessitate modification. If, for instance, it is seen when the teeth are being set up that there is apparently too little room for the heated posts between the base of the teeth and the model, sufficient space may be obtained by hollowing out the base of the teeth, which should be set up with the pins in place, before investing. In certain partial cases the teeth cannot be brought away in the upper half of the flask, but must be covered by the investment in the lower half. Here a difficulty may arise with regard to the rubber not flowing around the posts in the tubes. This may be overcome by filing a little off one side of each of the posts to allow the rubber to fill the tubes, or by filling the tubes and surrounding the heads of the posts with rubber before investing, as already described, when most or all of the rubber surrounding the heads of the pins may be removed and replaced by fresh rubber while the case is being packed; or the teeth may be removed before the case is

Fig. 163.

Ash's aluminum alloy post, roughened.

invested, and in order to facilitate their removal without altering the position of the posts, the base of the teeth should be oiled to prevent the wax from sticking to them. The case should then be invested without the teeth, the pins being securely held in the investment, and after being vulcanized the plate should be finished in the usual way, the teeth being either cemented to place before the case is finished or stuck on temporarily with hard wax during the finishing process, otherwise the edges of the vulcanite sockets may be too much rounded in finishing.

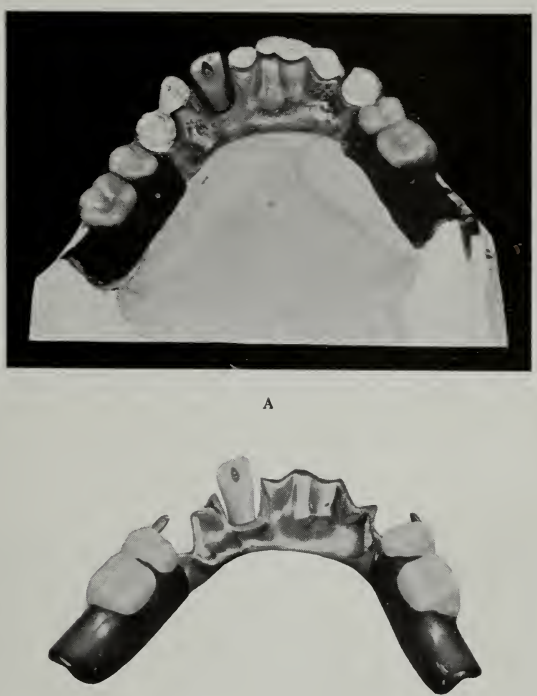
Another method is to coat the pins and interior of the tubes with plaster or whiting, and thus prevent the rubber from flowing into the tube, and after vulcanizing—but before finally finishing the plate—remove the teeth, and afterward fix them on with cement.

Combination plates of gold or other metal wherein vulcanite is employed as

* These posts are made of an aluminum alloy, which does not oxidize during the vulcanizing process.

a means of attaching the teeth to the plate, as well as vulcanite plates with gold or wire strengtheners, afford equal opportunities for employing tube teeth or gum tube teeth or sections, while in addition they permit of their use in certain cases whereby their peculiar advantages are made available; Fig. 164 shows a partial lower combination plate where plain teeth with vulcanite attachments have been used to supply the grinding teeth, while the missing lateral is supplied by a tube tooth. Here the advantage of the tube tooth is apparent, and for several reasons. Owing to the canine having moved backward, a space has been left between the canine and central, too small to permit of the use of two normal sized teeth, yet too large for one, without the risk of showing the metal backing or vulcanite attachment. Moreover, the probability of having to replace such a tooth owing to fracture, shortening of the tooth due to the sinking of the plate, etc., is greatest where an isolated tooth is concerned. By employing a tube tooth we insure easy replacement, without the necessity of soldering or vulcanizing, while at the same time there is the advantage to be derived from an all-porcelain tooth, and the peculiar advantages which result from the employment of the tube form. Where one or more tube teeth are used in the manner described, the attachment should be by means of cement or sulfur, but where the whole of the gold is covered with vulcanite, the attachment may be carried out by its means, although generally speaking it is best to cement the teeth

FIG. 164.



A

B

Partial gold and vulcanite plate. A, On model. B, With isolated tube teeth.

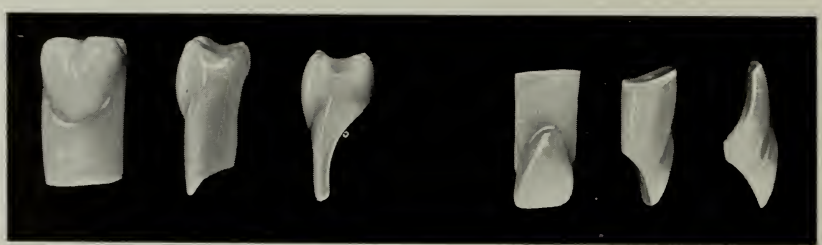
on to the pins after the case is vulcanized. Instead of pins depending upon vulcanite for their anchorage, pins cast with the gold plate or soldered on to it may be used. This method necessitates the use of a face bite, in order to obtain the correct position of the pins, which may

Fig. 165.

Tube teeth with cone-shaped base.

be of gold or dental alloy. The pin should be roughened to afford a hold for the cementing medium, but the porcelain tubes are rough enough to afford the necessary hold. In the case of the grinding teeth, it is an advantage to make them slightly cone-shaped (Fig. 165), as thereby there is less risk of undermining them—particularly on their lingual surface during the finishing process—than when their surfaces are parallel or nearly so. The vulcanite should always be carried up about a sixteenth of an inch from the base of the teeth on their lingual surface. This furnishes a socket and permits of a better finish being obtained. When the plate is of gold and vulcanite, the provision for attachment of the vulcanite to the gold may be by means of catches in the ordinary way, or the pins for the teeth or sections may be soldered to the plate, when the surfaces to be covered by the vulcanite need only be roughened by means of a graver, as the pins and teeth will afford ample hold. Wire strengtheners may also be used to carry one or more teeth in a similar manner to that suggested in connection with gold plates or strengtheners, and experience of individual cases will decide as to the advisability or otherwise of employing a combination of soldered and detached pins. When it is intended to remove the teeth after vulcanizing, and set them with cement, the pins should not be roughened until after the plate has been finished. The removal of the teeth may be readily effected by heating them slightly, when by means of a pair of forceps, the blades of which are covered with lead in order to avoid the danger of damaging the teeth, they may be readily detached without danger of disturbing the pins, if reasonable care is exercised. In fact, the teeth can often be dislodged without heating if the precaution has been taken to coat the interior of the tube with plaster or whiting before vulcanizing.

Fig. 166.



A B C A B C

Single-gum tube molar and central. A, Front view. B, Side view. C, Tooth cut away for vulcanite attachment.

The application of single gum tube teeth or gum tube sections is carried

out on the same lines as in the case of single tube teeth, and the jointing of the various sections is done in the same manner as with ordinary gum sections. There is this difference, however, in connection with their preparation for the purpose of using them in connection with vulcanite only, or with a metal plate with vulcanite attachment, that ordinarily a certain amount must be ground away from the base of the lingual surface to permit of a sufficient amount of vulcanite underneath the blocks (Fig. 166), and for metal catches when a metal base or strengthener is employed. Instead of the ordinary form of catches, some of the pins may be soldered, and these will serve to anchor the vulcanite to the plate, as already pointed out, or the pins may be of the ordinary headed variety, and these will serve to anchor the sections to the vulcanite. The amount of vulcanite need seldom be so great as in the case of ordinary gum sections.

In cases of accident, necessitating repair or renewal of one or more teeth or sections this may be carried out without the necessity for vulcanizing.

Replacement of a tube tooth or gum tube section is usually a much more simple matter than in the case of plain teeth, or ordinary gum sections, for the reason that the tooth, or what remains of it, provided it has been fractured, may be easily removed, and a new tooth or section fitted and cemented to place.

In the event of the post being broken, a new post will require to be vulcanized in its place. It seems almost superfluous to remark that tube teeth and sections may be used along with all other forms of teeth or sections.

(To be continued.)

ORAL PROPHYLAXIS AS TAUGHT AT THE FONES SCHOOL.

By Mrs. T. A. GANUNG, Bridgeport, Conn.

(Read before the New Hampshire Dental Society, at its annual meeting, at Weirs, N. H., on June 18, 1914.)

IT has been my privilege to be a member of the first class that has ever been formed, I believe, for the study of Dental Hygiene. Dr. A. C. Fones of Bridgeport formed this class. Dr. Fones has had this subject deeply at heart for many years, and this past winter has given much time and personal effort and has gone to great expense to offer thirty-two women the opportunity of taking a practical course in dental hygiene, including a series of notable lectures, which are to be the subject-matter of a text-book, and about eight weeks of practical work. The lecturers included such well-known men as—

Prof. R. C. Osborn of Barnard College: Anatomy.
Dr. A. M. Prince of Yale: Physiology.
Prof. L. F. Rettger of Yale: Bacteriology.
Dr. R. H. W. Strang of Bridgeport: Special Anatomy of the Head and Jaws.
Dr. G. M. McKee of New York: Dermatology.
Dr. E. C. Kirk of Pennsylvania: Oral Secretions and The Psychology of Handling Children.
Dr. Miner of Harvard: Inflammation.
Dr. E. H. Smith of Harvard: Dental Caries.
Dr. M. L. Rhein of New York: Alveolar Abscess.
Dr. R. J. Hutchinson of New York: Pyorrhea Alveolaris.
Dr. R. Ottolengui of New York: Orthodontia.
Dr. C. R. Turner of Pennsylvania: The Teeth as a Masticating Machine.
Dr. R. H. Chittenden of Yale: The Chemistry of Food.
Dr. M. I. Schamberg of New York: Oral Surgery that Might Have Been Prevented by the Dental Hygienist.

Dr. E. S. Chayes of New York: The Sanitary Aspect of Dental Operations.
Prof. C. W. Crampton of New York: Personal Hygiene.
Prof. I. Fisher of Yale: Posture and Fresh Air.
Dr. W. G. Anderson of Yale: Lengthening the Life of the Resistive Forces of the Body.
Dr. T. Hyatt of New York: Teaching Dental Hygiene to Children.

And last but not least, Dr. A. C. Fones, who gave us five very instructive lectures on Dental Prophylaxis, and who personally instructed each woman in the practical work and gave each the benefit at all times of his broad experience in dental prophylaxis.

RANGE OF LECTURE COURSE.

These lecturers, wherever possible, illustrated their lectures with pictures to bring out the specific points, and vividly presented the clinical phenomena of alveolar abscess, pyorrhea alveolaris, malocclusion, etc. The impressions left with the pupils by Professor Crampton of New York and Dr. Anderson and Professor Fisher of Yale were very pleasing, making them anxious to take advantage of nature's gifts, *i.e.* fresh air and water, correct posture, breathing exercises, sleeping out of doors, etc. Professor Anderson of Yale, after his talk, took the class out on the gymnasium floor at Yale and instructed the pupils in some valuable exercises. One might say, What has posture, breathing, exercising, sleeping out of doors, etc., to do with dental hygiene? Yet all these factors affect the blood supply, and good blood supply is certainly necessary for healthy gum tissue and a generally healthy mouth.

PRACTICAL ROUTINE PROPHYLAXIS.

Our big aim in dental hygiene is prophylaxis, *i.e.* prevention of caries and disease resulting from caries and unclean mouth conditions. We are anxious to help our patients to an understanding of the importance of cleanliness of the mouth at all times, by the aid of prophylactic treatment and proper brushing of the teeth. By proper brushing we mean a thorough brushing of the teeth and gums; emphasis is to be laid on the gums, because if the gum tissue is kept clean we are fairly sure of keeping the teeth clean also. By artificially increasing the blood supply to the gum tissues, we also increase the blood supply around the roots of the teeth. This artificial stimulation means perfect oxidation, thorough removal of waste material, and increased resistance of these tissues; therefore gum brushing is considered to be exceedingly important. This brushing is to be done according to instructions given individually to all patients, requesting them to brush their teeth so that the prophylactist may observe and criticize. This exercise is repeated at least four times a day, and *every* day, the brushing to be followed by the use of dental floss at least twice a day, rinsing of the mouth with lime-water, and finally rinsing with plain water. The use of dental floss and lime-water is especially urged in conjunction with the brushing before retiring, as the sleeping period is the ideal time for the microorganisms to do their destructive work, an unclean mouth being an ideal incubator for germ growth, presenting as it does, decayed food, darkness, heat, and moisture.

We hope and expect that when children are brought to the dentist for prophylaxis early in life, even at the early age of four years—according to health conditions and temperament—before dental caries starts, and when these children obey instructions as to the home care of the mouth, we may be able to prevent at least 90 per cent. of dental caries, do away with the fear of the dental chair, and make prophylactic treatment no more to be dreaded than a shampoo or a haircut, with this difference—that the prophylaxis is vastly more important to general health.

TESTS REGARDING THE VALUE OF DENTAL HYGIENE.

Experiments and tests have been made in institutions and schools, notably in

St. Vincent's orphan asylum in Boston, and one of the grade schools in Cleveland, as to the value of dental hygiene. One of the most striking features of the St. Vincent's orphan asylum test was that, while there had previously been annually from eighty to one hundred cases of sickness among the children due to infectious disease, after the children had their mouths put in order and kept under monthly dental inspection and treatment, the sick list was reduced to six cases of measles and one of diphtheria in the eighteen months ending in December 1913. These cases occurred in children who had been recently admitted and had contracted the disease outside. On examination, these children were all found to have very bad mouth conditions.

Miss O'Neill, principal of the Cleveland school mentioned, gave a lecture before the Fones class on the wonderful results obtained in her school. Thirty dull, backward, unhealthy children were selected, their mouths put in good condition, and monthly dental inspection and treatment instituted, these children fully obeying instructions as to brushing and home care of the teeth. By this test it was proved beyond a doubt that constant attention to mouth conditions is of the greatest possible benefit to general health and happiness. In both these test cases mentioned, the improvement amounted to from 60 to 99 per cent. in general condition and studying ability; the children became more self-respecting and took pleasure in helping other children; bad boys were changed to good boys, dullards into good students. Dr. White of the New York State department of Health, has carried out experiments along this line, and has noted in all cases an improvement of from 60 to 90 per cent. in general condition. If after their mouths have been put into healthy condition, and are kept so, children acquire from 60 to 90 per cent. more efficiency in school work, it would seem as if free school clinics would have to be established for the sake of economy.

Aside from the children, adults come in for their full share of instruction and help to better ways. The mouth is the gateway to the human body, and if we will but reason out that passing food through unclean and decayed teeth means passing poison to the stomach, where it is absorbed and carried through the entire system, we readily see the need for insisting on clean teeth and prevention of caries. We all know people to whom we would like to say that "A man is known by the teeth he keeps." Dr. Neff, an authority on tuberculosis, defies anyone to cure or improve a case of tuberculosis if the patient has decayed teeth. In the lectures this past winter, the pupils of the Fones class have been shown many cases of ill health which were all traced to bad mouth conditions, pyorrhea alveolaris, alveolar abscess, etc.

PRACTICAL COURSE IN MOUTH SANITATION.

After finishing the lecture course, practical work was commenced by first using manikins with rubber cheeks and tongue, two full sets of teeth, and movable jaws. By a couple of weeks of daily practice on manikins the pupils became familiar with handling the instruments and the patient properly. The pupils were taught a system of going over the teeth with instruments and porte-polishers, the correct position of holding instruments, the best fulcrum points, and the sequence of the teeth to be cleaned. For first practice, the manikin teeth were thoroughly pencil-marked, which gave the pupil practice in polishing with an orange-wood stick. For the next exercise, the teeth were covered with deposits, which were to be removed, so as to give the pupil instrument practice. Each pupil had to pass an examination in every stage of the work. The next step consisted in cleaning children's teeth. The class cleaned between seven and eight hundred children's teeth, each child receiving thorough instructions as to brushing, and demonstrating with his brush that he had understood the instructions given. When the children brought no brushes

with them, Dr. Fones furnished them therewith.

Some very amusing and some rather pathetic incidents occurred. One day a boy presented his appointment card, and it proved to be dated for the day before. When asked about this, he replied, "Well, I'm not Billy Jones, but Billy didn't have to give up his ticket yesterday, and we thought I might get my teeth cleaned on it too." Needless to say, his teeth were cleaned. I asked one of my little patients one day if he had his tooth-brush with him, whereupon he produced from his pocket a rather hard-looking brush, well worn and far from clean. I started giving him instructions in brushing, while his brush was soaking. Conscience apparently bothered him, for he finally stammered, "Eh! that isn't *my* brush; it's my uncle's, but he lets me use it." He was then given a brush for his exclusive use upon the promise that he would keep it as his own property. In practically every case the children were anxious to learn to care for their mouths, and we hope that we drilled them sufficiently in brushing so that at least a large percentage of them will be greatly benefited.

The practical work was finished by cleaning adults' mouths, and many advanced cases of tartar deposits, pyorrhea alveolaris, etc., were found.

In this training the pupils are taught to attempt nothing beyond prophylactic treatment, *i.e.* cleaning, but these cleanings are to be most thorough, not a hasty running over the teeth with a rubber cup in the engine, but a thorough removal of all tartar and stains by careful instrumentation, followed by a thorough polishing of the tooth surfaces, labially, bucally, lingually, above and below the gum margin, with an orange-wood stick dipped in fine powdered pumice and hydrogen dioxid, taking care to reach the approximal surfaces, then using dental floss dipped in pumice for reaching approximal surfaces difficult of access, and finishing up the grooves and fissures of the occlusal surface with the bristle brush in the engine.

After finishing a prophylactic treatment, improper conditions, such as poor crown and bridge work, pyorrhea conditions, and suspicious points where trouble might arise, are to be carefully noted, and all such cases are to be reported to the principal for his attention. The Fones pupils hope and expect that by conscientiously following the principles of their training they will be of good service to both the dentist and mankind generally.

On June 5th the class formed the Connecticut Dental Hygienists' Association, and on the same day fitting graduation exercises were held in the Fones schoolroom, which on less festive occasions presents the appearance of an interesting operating room fully equipped with sixteen chairs, lights, sterilizing equipment, etc. Many of the lecturers were present on this occasion to wish every good fortune and success to the first class in Dental Hygiene, which extended to Dr. Fones sincerest thanks for his untiring efforts in helping them to a very interesting and beneficial course.

BACTERIA OF THE MOUTH, AND THEIR RELATION TO SYSTEMIC DISEASE.

By F. E. STEWART, Ph.G., M.D., Philadelphia, Pa.,
PROFESSOR OF MATERIA MEDICA, DEPARTMENT OF PHARMACY AND CHEMISTRY, MEDICO-CHIRURGICAL COLLEGE, PHILADELPHIA.

(Read before the Susquehanna Dental Association of Pennsylvania, at its annual meeting, Delaware Water Gap, May 26, 1914.)

THIS paper is not intended to be an original contribution to knowledge, neither does it present my personal views or opinions. It is a compilation of the results of many observers concerning the origin of oral sepsis, its effects on the health, its prevention, and brief reference to its bacterin treatment.

THE CONSTANT PRESENCE OF BACTERIA IN THE MOUTH.

It is said that thirty kinds of bacteria have been found in the oral cavity. In fact, Miller,* in his book published over twenty years ago, claimed to have isolated "more than one hundred different kinds of bacteria from the juices and deposits in the mouth." The staphylococcus and streptococcus are permanent residents; the pneumococcus is found in about ninety per cent. of persons examined; and other germs are so frequently present as guests, that to find them there is not at all surprising.

As a rule, these bacteria do us no harm. They live with us as commensals or messmates, deriving their sustenance, like dogs, from the crumbs which fall from the master's table. But, like dogs, they sometimes turn and bite the hand that fed them.

As already stated, the mouths of ninety per cent. of healthy persons examined showed the presence of the pneumococcus. This organism lives on particles of food, cast-off epithelial cells, etc., and usually does no harm; yet it may become the causative factor of pneumonia, may take part in producing pulmonary phthisis, is one of the invaders in pyorrhea alveolaris, and one of the important factors in the production of rheumatic symptoms.

EXPLANATIONS FOR THE PATHOGENICITY OF BACTERIA.

The streptococcus, also ordinarily a harmless saprophyte, may cause oral sepsis, erysipelas, puerperal fever and septicemia or blood poisoning, streptococcic sore throat, acute rheumatic arthritis, endocarditis, and many other affections.

These facts are significant. Why should these apparently harmless microorganisms become under certain circumstances the deadly foe of man? The answer to this question is very important to the health and life of the community, and of special interest to the practitioner of dentistry, because the mouth is a place where these organisms may learn to become parasites, and be changed from useful servants to deadly enemies. Streptococci are useful servants when they aid in giving flavor to butter and cheese, but when they are transmuted into pathogenic or disease-producing bacteria they are indeed dangerous to health and life. E. C. Rosenow* has been able to convert hemo-

* Miller, "Micro-organisms of the Human Mouth," 1890.

* E. C. Rosenow, *Journ. Infect. Diseases*, 1914, xiv, 1.

lytic streptococci into streptococcus viridans and other forms, and to change these about almost at will. Possibly every kind of bacteria started as a harmless saprophyte and owes its pathogenic form to transmutation occurring in the animal body.

Most bacteria, if placed upon living tissue, are unable to attack it, and soon die; but if they are placed upon the same tissue after it is dead, they feed upon it readily. Most bacteria are therefore saprophytes or feeders on dead organic matter.

Bacteria live, grow, and multiply by converting the organic matter upon which they feed into bacterial tissue. This they are able to do because the protoplasm of which they are composed has inherent within it the power of ingesting, digesting, and assimilating food.

Prof. Randle C. Rosenberger* of the Jefferson Medical College, Philadelphia, believes that it is the number of the bacteria and not their types that bring about a condition of sepsis in the mouth. If the mouth is not properly attended to, food particles and desquamated cells tend to increase, and this makes an exceedingly rich pabulum for the multiplication of bacteria. As a result, products of decomposition and fermentation are formed, and perhaps minute erosions or ulcerations make their appearance, thus giving the bacteria an opportunity to obtain a foothold and grow in the mucous membrane or dental tissues. It would seem to me that it is the character of the bacteria, as well as the number of bacteria, that makes them dangerous. A bacterium—the tubercle bacillus, for example—that learns how to digest living human tissue at once becomes a man-eater, like the tiger that has tasted human blood.

Having become a man-eater, the bacterium greedily devours the tissues upon which it is placed, and except for the defensive powers with which the tissues are endowed, this destructive process would rapidly continue until the entire body of the infected individual would be consumed.

The tissues have the power of defending themselves against bacteria by producing enzymes and so-called anti-bodies (amboceptors, opsonins, bacteriolysins, etc.) which digest and destroy the bacteria. These enzymes are produced in response to the stimulating action of the bacterial split products upon the body cells of the infected individual.

VAUGHAN'S EXPLANATION OF BACTERIAL SPLIT PRODUCTS.

What do we mean by "bacterial split products?" Let us turn to Prof. Victor C. Vaughan for an explanation.

Vaughan* calls attention to the fact that bacteria and tissue cells are living proteins, and the digestive action of one on the other is a proteolytic digestion. The breaking-up of the proteins by enzyme action splits the protein molecule into two or more portions, one of which is a poison. This poison is set free to a greater or less extent, and to the extent that the poisonous portion of the bacterial protein is set free by tissue-cell digestion the infected person is poisoned. In this way he accounts for the toxemia of the infectious diseases.

This poison, however, is not specific. It is the same in relation to all proteins. The specificity of the digestion lies in the secondary portion of the protein molecule.

It is well known that a state of immunity frequently exists in those who have recovered from certain infectious diseases. According to Vaughan, when the protein molecule is undergoing digestion by the body cells, a new and powerful specific proteolytic enzyme is produced which has the power of destroying the kind of bacteria causing the infection. The power acquired by certain body cells to produce promptly this proteolytic

* Prof. R. C. Rosenberger, "Infections of the Mouth, Including Oral Sepsis and Dental Decay." Read before the Academy of Stomatology, Philadelphia, December 19, 1911.

* Victor C. Vaughan, M.D., LL.D., "Protein Split Products in Relation to Immunity and Disease."

enzyme on re-exposure to the disease accounts for the immunity against subsequent attacks.

THE PATHOGENICITY OF BACTERIA IN THE MOUTH.

Let us apply these facts to the subject before us.

I have called attention to the mouth as a place where bacteria may learn how to become parasites, *i.e.* learn to grow and multiply in the tissues of the animal body. These bacteria find conditions of life very satisfactory in a dirty mouth. They are provided with a warm habitation and plenty to eat and drink, and thrive luxuriantly. As long as the mouth tissues maintain their vigor, or the accumulation of bacteria is not so great as to overcome their resisting power, no opportunity is given for the bacteria to become parasites. But lowered vitality in some spot or a rupture in continuity may occur, and thus afford favorable opportunity for local infection. The germ, having learned how to subsist on living tissue, may not only do irreparable damage to the tissue originally infected, but also infect a nearby tonsil. Rosenow sees in the tonsil a place where streptococci acquire the peculiar property necessary to produce the disease known as rheumatism, with its involvement of the joints, affections of the heart and other concurrent phenomena. From the tonsil or other focal infection the germ may find its way into the circulation and give rise to infection of some other organ.

Rosenberger says:

> Personally, I believe that the ingress of bacteria into the blood stream does not very often occur from decayed teeth or diseased gums. What does occur far more frequently is absorption of the products of the bacteria. . . . In other words, it is to the toxicogenic bacteria that most symptoms are due —or auto-intoxication. The headache, the flushes of heat, pain referable to the eyeballs, sometimes slight or pronounced fever, malaise and other vague symptoms, chills or pronounced rigors, can very easily be traced in some cases to the conditions of the teeth and mouth. The gastric disturbances, the intestinal disorders, with apparently no cause from errors of diet, can be due to the continual swallowing of the products of putrefaction and decomposition going on in the mouth as a result of accumulated bacteria and their products. Apart from the symptoms referable to the stomach and intestines, it seems reasonable to suppose that other viscera may suffer from the intoxication. It is well known that Hunter, our English colleague, believes that Bright's disease, mucous colitis, and even sclerosis of the spinal cord and joint affections, may occur from oral sepsis, as well as many instances of general malnutrition. In some instances of profound anemia, resembling in its blood picture pernicious anemia, symptoms referable to the stomach and intestines are very common. It is possible that the condition of the mouth with its products of decomposition plays a part in the alteration of digestive ferments, and thus brings about improperly prepared and improperly masticated food for gastric digestion.

THE BACTERIA IN PYORRHEA ALVEOLARIS.

Examination by Dr. C. P. Brown,* of the Mulford laboratories, of the pus from the pus pockets of pyorrhea alveolaris secured by Dr. Joseph Head of Philadelphia, demonstrated the almost universal and continual presence of six kinds of bacteria, namely, bacillus influenzæ, the streptococcus, staphylococcus, pneumococcus, micrococcus catarrhalis and diphtheroid bacilli. Goadby found in the early stages of pyorrhea alveolaris, micrococcus catarrhalis, bacillus septus, micrococcus pneumoniæ, bacillus necrodentalis (Goadby), streptococcus brevis, and micrococcus citreus granulatus (Freud). In the later stages of the disease he found micrococcus catarrhalis and streptococci of various types, and also the streptobacillus (Goadby). Allen† considers that the spirochetes and spirilla found in the mouth are connected with, if not responsible for, the severe anemia which is sometimes met with in cases of pyorrhea alveolaris.

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* C. P. Brown, "The Bacteriology of Pyorrhea Alveolaris," *N. Y. Med. Journal*, December 20, 1913.

† Allen. "Vaccine Therapy, Its Theory and Practice." Blakiston, Philadelphia, 1913.

Cummins* considers the streptococci and the streptobacilli to be the germs usually immediately concerned in the arthritic and other auto-intoxication processes sometimes connected with the pyorrheal infection. Rosenberger found on the mucous membrane pneumococci, streptococci, staphylococci, and various bacilli, and around or in decayed teeth organisms which belong to the class of the ray fungus (actinomyces). According to the same authority, yeasts and molds may also be present, as well as the micrococcus catarrhalis. Spirilla are not uncommonly found, especially when decayed teeth are present.

IMMUNITY AGAINST BACTERIAL INVASION.

Assuming some one or more of the bacteria mentioned in the above list to have penetrated the natural defenses of the body and started a colony in the mucous membrane of the mouth, stomach, or intestine, or in some one of the viscera, what happens? The tissue cells and the leucocytes commence to digest the invading bacteria with their enzymes, and split up the bacterial protein into two or more portions in the manner described by Vaughan. If the protein is effectively digested, very little if any of the poisonous portion of the protein molecule is set free and no toxic symptoms appear. The secondary group of the protein molecule split off during the digestion stimulates the body cells to produce Vaughan's specific proteolytic ferment which aids in destroying the colony of bacteria, and a certain amount of immunity is produced against further attacks. Each colony of bacteria started in various parts of the body may have a similar history. The patient may be immunized by dose after dose of bacteria. Immunity thus produced is probably sufficient in most instances to keep the body from being seriously infected. But after a time the "mechanism" of immunity partially breaks down, and then follows the train of symptoms already described which occur as the result of the growth and multiplication of the infecting organism in the part of the body invaded.

The theory of immunity produced in the manner just described is well exemplified in the following statement by Dr. Chas. E. Woodruff,* lieut.-col. U. S. Medical Corps (retired). In discussing the subject of tuberculosis before the annual meeting of the Medical Association of the Greater City of New York, January 19, 1914, Woodruff called attention to the present belief that every child is born free of tuberculosis, but soon acquires it, and that in everyone the lesions become active sooner or later. He says that it is probable that all civilized people are tuberculous and undergoing constant auto-vaccination, causing an effective immunity. No one was ever infected in adult life. If incipient tuberculosis develops in an individual, it is, according to this authority, because something has interfered with his manufacture of anti-bodies.

Cummins in his interesting paper on Oral Sepsis, classifies the results of this invasion according to the system involved, as follows: (1) Alimentary system. (2) Arthritic system. (3) Nervous system. (4) Circulatory system. (5) Cutaneous system. (6) Respiratory system. (7) Primary affections taking place in the mouth and its immediate neighborhood. He states:

> The conditions which lead up to the involvement of the alimentary tract are easily understood. An enormous number of bacteria are swallowed in a case of pyorrhea alveolaris. They are received into the stomach both during and between meals, at all times of the day and night. There is no doubt that the gastric juice possesses inhibitory and bactericidal power upon these organisms. But the continued abuse of this defense can only lead to its destruction. Dyspepsia, flatulence, and indigestion with all their varied symp-

* Robert C. Cummins, M.B., "The Results of Auto-intoxication Taking Place from the Mouth in Oral Sepsis, and Its Treatment by Bacterial Vaccines," *Journ. of Vaccine Therapy*, March 1913.

* Dr. Chas. E. Woodruff, *N. Y. Med. Journal*, May 16, 1914, p. 1007.

toms follow, and the general health is undermined; septic gastritis and gastric ulcer occur.

Dr. Wm. H. Haskin* of New York City does not agree with Cummins concerning the bacterial power of the gastric juice. He says:

The old theory that all bacteria are killed by the acid of the gastric secretion becomes clearly absurd when we realize that this acid is only found during the active period of digestion of solid foods. It requires some time for the stomach to provide enough of this free acid to have any effect on the bacteria which have in the meantime escaped into the smaller intestine with its alkaline secretions. Every mouthful of fluid, even the saliva, is contaminated, and these bacteria are not even subjected to any possible effect of the acid, as the secretion is not stimulated except by solid food.

Goadby† has demonstrated the identity of the infecting organisms in certain cases of coexistent pyorrhea alveolaris and articular rheumatism, and it is now quite generally conceded that focal infections in various parts of the body and by different kinds of micro-organisms may cause so-called rheumatic symptoms.

NERVOUS DERANGEMENT DUE TO ORAL SEPSIS.

The various nervous affections attributed to oral sepsis include toxic neuritis, the nervous symptoms of anemia, etc. Prof. Lewis M. Ferman‡ of Leland Stanford University says that—

Bad teeth may cause nervousness either indirectly by causing malnutrition or directly from the reflex irritation which aching or crowded teeth produce. Motor automatisms sometimes result and moral self-control may become impossible. Even choreiform movements and epileptiform seizures may occur. Dr. Jessen examined the teeth of thirty-one stammerers and stutterers and found nearly twice the usual amount of defectiveness. Another investigator examined fifty-eight persons with the skiagraph (an instrument for recording irregularities of the teeth), and found that all who suffered impaction showed signs of nervous disorder. The symptoms ranged from headaches and restlessness to epilepsy, and from mild insomnia to dementia præcox. The same author reports that six out of eight such cases recovered upon relief of the impaction. It is significant that in no case was there any local pain, and in only a few, pain of any kind. Holmes describes an interesting case of moral delinquency and nervous instability which appeared to be the result of impacted teeth. The boy became irritable, nervous, and restless, gradually developing incorrigibility and habits of lying and stealing. He was brought before the juvenile court, treated for adenoids, etc., to no avail. Finally a dental examination was made which disclosed an extraordinary condition of impacted teeth. Treatment was followed by return to nervous control and complete moral reform.

CIRCULATORY AND RESPIRATORY DISEASES DUE TO ORAL SEPSIS.

The circulatory diseases include inflammatory affections of the endocardium and the arteries. Among the cutaneous effects are erythema, urticaria, purpura hemorrhagica, acne, eczema, seborrhea, alopecia areata, herpes, etc. The respiratory effects include septic tonsillitis, acute and chronic bronchitis, etc. The condition of the lungs brought about by the infecting organisms may pave the way for tuberculosis, and the infecting germs may become the factor in the mixed infection of phthisis. Knopf has written extensively on the question of diseased teeth and their effect on tuberculosis, and shows the possibility of their being one of the chief causes of infection. He also says that it is almost impossible to cure tuberculous patients who have bad teeth. Oral sepsis is also

* Dr. Wm. H. Haskin, "Some Gateways of Cryptogenic Infection: The Alveolar Processes," *Laryngoscope*, March 1914.

See also "The Surgical Relationships of Mouth Infections," by Thos. B. Hartzell, M.D., D.M.D., *N. Y. Med. Journal*, May 23, 1914, p. 1034.

† For Goadby's writings on this subject see *Proc. Roy. Soc. Medicine*, 1910, vol. iii, p. 58; *Lancet*, 1911, vol. i, p. 609; The Erasmus Wilson Lecture on Pyorrhea Alveolaris, 1907, vol. i, p. 633; *Brit. Med. Journal*, 1909, vol. ii, p. 677.

‡ Prof. Lewis M. Ferman, "The Hygiene of Children," Houghton, Mifflin & Co.

said to be responsible for cases of pharyngeal abscess, septicemia, acute, subacute and chronic, also for diseases of the ear, including mastoid disease, diseases of the Eustachian tube, etc.

FAR-REACHING INFLUENCE OF ORAL SEPSIS IN APPARENTLY HEALTHY PERSONS.

It has been urged against the oral sepsis theory of infection that the majority of people of fifty years have pyorrhea alveolaris, and comparatively few people manifest symptoms of intoxication. Indeed, many individuals have been found in which oral sepsis is severe, and yet no marked symptoms of ill health appear to exist.

However, Cummins says that examination in many cases of pyorrhea alveolaris not showing any special symptoms of intoxication has demonstrated continued mild intoxication, manifested by depression, dyspeptic symptoms, and indigestion; and in course of time the indigestion results in anemia and diminished resistance to bacterial invasion. He says that such cases may develop duodenal ulcer, gastro-enteritis, catarrhal conditions of the gall-duct, inflammation of the appendix, chronic diarrhea, and intestinal stasis. Rosenow has proved that gastric ulcer may be caused by streptococcic infection due to oral sepsis, the bacteria causing the ulcer being derived from blind alveolar abscesses. He has also proved the same source of infection to have caused endocarditis and other diseases.

SERIOUS RESULTS OF NEGLECT OF CHILDREN'S TEETH.

The serious results of neglecting the teeth of children are strongly emphasized by Professor Ferman in his book recently issued, in which he calls attention to Dr. Wm. Osler's belief that more physical degeneracy can be traced to neglect of the teeth than to the abuse of alcohol. It certainly affects directly many more people. This author states that—

Examinations of thousands of school children in divers parts of the world have shown that fewer than 10 per cent. of our school children are free from diseased teeth or gums, dental caries (decay of teeth) being the most common defect. The average school child has from three to five decaying teeth. Many investigations report as many as 20 to 30 per cent. of all the teeth as affected. In New York City, 61 per cent. of 266,426 children examined had defective teeth, but less than one-fourth had ever entered a dentist's office. The Dental Association in Cleveland found 15,061 cavities in the teeth of 2677 children, or an average of 5.6 per child. Boston reports 33,575 school children as in need of dental services, and Brookline 77 per cent. Of 500 New York children who in 1909 applied for certificates permitting them to leave school to go to work 486 had 2808 decayed teeth; only 5 per cent. had ever visited a dentist except for an extraction, and there was not one "decently clean" mouth in the 500. Smaller cities have given similar results. Superintendent Johnson reports dental caries in 96.9 per cent. of 497 children of Andover, Mass., and 31.4 per cent. of all the teeth, as affected; 22.5 per cent. of the children had suffered from toothache within the previous week. Superintendent Reavis examined 407 children in Oakland City, Ind., and found only 53 with satisfactory teeth; 210 children had from 1 to 4 decayed, and 133 from 5 to 10; 44 children had all four of the six-year molars in a carious condition.

CHILD-FEEDING AND FOOD HABITS RESPONSIBLE FOR THE INCREASE OF DENTAL CARIES.

The main cause of infantile malnutrition, according to Ferman, is artificial feeding. He says:

Michael investigated the relation of dental caries to infant feeding in 11,762 children. Those who had been suckled ten months or more had only 9 per cent. of their teeth carious; those fed on cow's milk, 22 per cent., those whose principal diet was oatmeal-water, 27 per cent. Children suckled six months had teeth correspondingly inferior to those suckled ten months. Röse's study of 157,000 children shows the same thing. Even the mother's milk is sometimes inferior, due to worry, overwork, alcoholism, specific disease, etc. Jewish children, who as a rule are breast-fed and otherwise well cared for, are much less subject to dental caries than other chil-

dren. It has not been demonstrated that the difference is one of racial heredity. From an examination of many skulls, Underwood shows that dental caries is ten times as prevalent in western Europe today as it was a hundred years ago. European skulls of the eighteenth century average about one decayed tooth each; those of today about ten. Smith examined over 50,000 Egyptian skulls, and found practical immunity up as far as 4000 B.C.; after that a rapid increase. Of 500 "aristocratic" skulls dating from the pyramid epoch only a fifth were free.

It hardly seems possible that actual racial degeneracy as regards the power of the teeth to resist decay could establish itself so universally in a few generations. Nor is it necessary to assume such degeneration. Underwood, who has made the most extensive researches in this field, holds that the facts are readily explained in terms of changed food habits. Cooked, mushy, and sticky foods have replaced foods that were resistant and fibrous. The consumption of sweets has been multiplied many times. Mastication can more easily be slighted. This tends to produce irregularities of the teeth and maldevelopment of the jaws. Babies are less often nourished in the natural way, and all through childhood there is a deficiency of the sunlight, air, and activity necessary to healthy growth. The disease is a disease of civilization. For these and other reasons the prevention of dental caries is becoming a more difficult problem than ever before. If the disease is not arrested, micro-organisms will soon score their first complete victory.

Appropriate preventive treatment during childhood would probably insure good teeth to a majority of adults. Preventive measures should include especially cleanliness, thorough mastication, suitable food, the care of the temporary teeth, nutrition during infancy and childhood, the prevention of decay, the prevention of irregularity and the repair of defects as rapidly as they appear. To this end the school can make two contributions of the greatest importance: It can instruct children more thoroughly than it now does in the essentials of mouth hgyiene; and it can undertake preventive and curative treatment in school dental clinics. In fact, there is no other matter of health where the proverbial ounce of prevention will go so far.

IMPORTANCE OF ORAL HYGIENE.

Haskin says, "There is not one single thing more important to the public in the whole range of hygiene than the hygiene of the mouth." J. B. Murphy, Hunter,* Collins, Eyre and Payne,† Colyer,‡ and many other authors lay stress upon the danger of infection from septic conditions of the oral cavity. This vast amount of evidence accumulated by the experience of competent observers is sufficient to warrant the verdict that a septic mouth is a serious menace to health.

VACCINE TREATMENT OF PYORRHEA ALVEOLARIS.

The treatment of pyorrhea alveolaris and the infections caused by it is a phase of the subject of too much importance for detailed consideration in such a short paper as this. However, brief reference to the treatment of this affection with bacterial vaccines is in line with the object of my paper, which is to bring the subject before you from the bacteriological viewpoint.

Referring to vaccine treatment, Prof. Rosenberger, from whose paper I have already quoted, says:

> Vaccine treatment—mostly autogenous vaccines—has been used with great success by a number of men in the treatment of pyorrhea alveolaris. Whether this is a permanent cure or not remains to be seen, but where gouty or rheumatic diathesis are the undermining causes, it does not seem that we have yet found *the* remedy for this affection. My personal views upon this affection are that the constant formation of pus and discharge which is for the most part swallowed by patients, is deleterious to health. The disease or condition is a progressive one and usually results in loosening and loss of the teeth, so why not advise extraction and substitute false teeth? The looseness of the teeth lessens the proper mastication of food, and this in itself is sufficient for gastric or intestinal indigestion or both. As the organisms most commonly present in the discharge are pyogenic ones, it seems reasonable to suppose that even

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* Wm. Hunter, "Severest Anemias; Oral Sepsis; Toxic Neuritis," *Practitioner*, December 1900.

† Eyre and Payne, "Vaccine Treatment of Pyorrhea Alveolaris," *Proc. Roy. Soc. Medicine*, 1910, vol. iii, Odont. Sec., pp. 29–61.

‡ Colyer, "Dental Surgery and Pathology."

stock vaccines may exert some beneficial results, but it appears that the ordinary bacterial flora, which are not easily cultivable, increase in this disease so that the pyogenic cocci vaccine does not seem in itself sufficient to overcome the process. If a vaccine were made from *all* the bacteria that are found in this process without trying to isolate the predominant ones, this mixed vaccine might alleviate or even cure the condition. Where in other pyogenic processes there is mixed infection, cures or improvement occur where mixed vaccines are used, and not where the most common organisms alone are used for this purpose.

A "bacterin" or bacterial vaccine is a suspension of bacteria, either killed or so modified as to prevent the bacteria from growing and multiplying in the body, while preserving the property of stimulating the body cells to produce antibacterial substances, when injected into the body.

The suspension is usually made in normal physiological salt solution. The bacterin is standardized by bacterial count, and as a rule preserved by an antiseptic; one-half of one per cent. of tricresol is generally employed for the purpose.

When a bacterin containing the same kind of bacteria as that causing a certain infectious disease against which the individual is to be immunized is introduced into the healthy body, its digestion by the body cells splits the protein molecule of the bacteria contained in the bacterin into two or more groups of atoms in the same manner as already explained in reference to the invading living bacteria causing an infectious disease. If the digestion of the bacterial protein is efficient, very little of its poisonous group is set free and reaction is reduced to a minimum. The immunizing group of the protein molecule set free by the digestion stimulates the body cells to elaborate the specific proteolytic ferment or enzyme to which the immunity to disease is due. Therefore more or less immunity to an attack of the disease is secured by the injection.

When a bacterin is used for the treatment of an infectious disease, the bacterin selected must contain the same kind of micro-organisms as those causing the attack. Injection of the bacterin is followed by the digestion of the bacterial protein in the manner above described. If the digestion is efficient, a minimum of the poisonous group is set free and no untoward reaction occurs. The immunizing group stimulates the body cells to form antibacterial substances which are taken into the circulation, carried to the infected area, and there aid the tissue cells and phagocytes in their battle against the invading disease germs.

Sometimes a marked reaction follows a dose of bacterial vaccines. This reaction is manifested by local soreness, also by systemic phenomena, such as fever, feeling of malaise, and possibly, but rarely, a cutaneous eruption. Vaughan teaches that these reaction symptoms are due to the inefficient digestion of the protein molecule, the symptoms being caused by the toxic action of the poisonous group, which is set free in large amounts under such circumstances. The importance of securing proper digestion of the bacterial protein injected is therefore apparent.

SENSITIZED VACCINES.

In 1902, Besredka,* a noted French scientist, devised a plan for increasing the digestibility of the bacterial protein, and thus to largely overcome the reaction due to the setting free of the poisonous group of the protein molecule. This he accomplished by macerating the bacteria in homologous immune serum, that is, serum from the blood of an animal immunized against the disease of the same kind as that produced by the living bacteria. What occurs when bacteria are macerated in homologous immune serum it is necessary for us to know, in order

* A. Besredka, "Concerning Vaccination with Sensitized Virus; Vaccination by Means of Sensitized Vaccines," also "Besredka's Sensitized Vaccines," by F. E. Stewart, M.D., Ph.G.; read before the Seaboard Medical Society, Norfolk, Va., December 1913, and published in the *New York Med. Journal*, Feb. 14, 1914.

to understand what is accomplished by this method.

All enzymes or digestive ferments, according to Vaughan, are composed of amboceptor and complement. The function of the amboceptor is to sensitize the protein substance to be digested, thus rendering it susceptible to the lytic or dissolving action of the complement. Normal blood serum has the property of digesting and destroying both living and dead protein substances. This property is possessed only to a limited degree. When an animal is immunized against a certain protein by the injecting of the same into its tissues or in other ways introducing it into the animal's body, it is found that the power of digesting said protein has been enormously increased. Examination of the blood serum now discloses the fact that this increase is due to the production of a specific amboceptor in large amounts, no increase having occurred in the complement. Now let us apply these facts to the subject before us.

When a bacterin is macerated in homologous immune serum for some hours, the amboceptor contained in the serum combines with the bacterial protein, thus rendering it susceptible to immediate and efficient digestion by the body cells when used either for prophylactic or therapeutic application. In other words, when the bacterial protein is presensitized, by macerating with the immune serum, it is prepared for the immediate action of the complement contained in the blood of the individual when it is injected into the body. The digestion by the body cells is immediate, efficient, and complete. Only a minimum of poisonous substance is set free by the digestion, and toxic symptoms are rarely manifested. The immunizing group of atoms set free by the disruption of the protein molecule stimulates the body cells to produce a large excess of specific amboceptor, which is at once taken into the circulation, and, when the bacterin is used for the treatment of the disease, sensitizes the invading bacteria and thus enables the complement in the patient's blood to act upon and destroy them speedily.

Pyorrhea alveolaris is a mixed infection, as we have already noted. In most cases, it is due to the presence of one or more of five or six principal types of bacteria. The object of treating pyorrhea alveolaris with bacterial vaccines is to stimulate the body cells to form substances antagonistic to the invading bacteria. For that purpose either an autogenous vaccine is employed containing the various germs found in the pus pockets, or a mixed polyvalent stock vaccine is used, which for reasons just given may preferably be a sensitized vaccine made according to the method of Besredka.

CONCLUSION.

In conclusion, I wish to again call your attention to the fact that this paper is a compilation containing the views of a large number of observers, for none of whom I am sponsor. I am presenting the paper for your discussion, not for the purpose of advocating any special theory of immunity or any special method of treatment. The bacterin treatment of pyorrhea to which I have called special attention because of its recent introduction and importance, is now undergoing investigation by leading members of the medical and dental professions. My paper is now before you for consideration, and I hope you will feel perfectly free to discuss its contents impartially.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

CORRESPONDENCE.

THE EUROPEAN WAR AND THE DENTAL SURGEON.

To the Editor of the Dental Cosmos:

Sir,—At a time when all Americans are watching the developments of the great war now raging in Europe, it is interesting to note what part our profession is called upon to take. Many, no doubt, are familiar with the work being done by many of our prominent *confrères* in the English, French, and German hospitals, where they are sharing with the medical staff the care of the wounded; but it remained for the *Deutsche Medizinische Wochenschrift* to emphasize the great value of the services of the dental surgeon in properly preparing the soldier for the hardships of active military service.

To quote from that journal. "—— insists that the teeth of the soldiers should be put in good condition before they are sent to the front. All broken-off roots should be pulled, even if they are not causing disturbance. The tissues around are seldom quite normal, and although there is no trouble under ordinary conditions, chilling, wetting, and trauma are liable to set up mischief in the old roots at any moment." He even goes back of the reservist to the children—the soldiers of the future—and emphasizes the necessity of systematic training in oral hygiene of children in school as a vital factor in building up the health of the rising generation, and reducing dental trouble in the land and sea forces. Dental prosthesis is of the greatest importance in cases of wounds of the jaw, as fracture of the jaw is of more vital consequence, he declares, than fracture of any other bone, perhaps. The Japanese army in time of war is supplied with ready-made adjustable splints for fractured jaws, and they restore the functional use of the jaw.

Also we note in the *Presse Medicale,* Paris, October 15, 1914, that Drs. Martinier and Roy, in an article on "Dental Prosthesis in Military Surgery," say: "The collaboration of the dentist is thus indispensable to the army surgeon for early assistance in treating wounds, not only of the jaws, but of the skull, while his aid is of paramount importance in the later treatment of wounds leaving defects of the jaws, nose, and ears."

It is gratifying to know that the United States army has had for nearly fourteen years a dental corps—very inadequate and insufficient in numbers, it is true, but yet it *has* this dental department, and it is very important that the dental profession see to it that this corps within the military arm is maintained upon the most efficient standing. Of course this is hardly possible under the present rate of advancement; that is, from the contract basis to the—one and final—grade of commissioned first lieutenant. In order to attract high-grade men, and more of them, to the corps, it is imperative that Congress be impressed with the necessity of increasing the grades within the corps to include the relative ranks of captain, major, and colonel. The few good men of the old original corps hang on from year to year, hoping that the dental profession can persuade Congress to

grant them the increase in rank which they justly deserve. And each year it becomes more and more difficult to obtain the best type of the young dentist to fill the vacancies made by the resignations of those who can see no chance of advancement.

And, further, the law now provides for only one dentist to each one thousand men: at some future date this should be increased to two dentists to each one thousand men, but for the present the dental profession should bend its every effort to obtaining the increase in the grades, and thus place the dental corps on an equal basis with other corps—such as the medical, signal, quartermaster, chaplains, etc.—the members of which far outrank the members of the dental corps.

Wm. C. Fisher,

Pres. Assoc. Milit. Dent. Surgeons.

New York, N. Y., December 1, 1914.

ANALGESIA BY MEANS OF $N_2O + O$.

To the Editor of the Dental Cosmos:

Sir,—In the report of the forty-sixth annual meeting of the Dental Society of the State of New York, contained in your November number, I have noticed that some of the most eminent members of our profession expressed themselves as being very skeptical as to the possibility of getting satisfactory results in analgesia by the use of nitrous oxid and oxygen in any considerable percentage of cases, and did not approve of the method, even though it could be used to enable one to relieve one's patients of much nerve-racking, which we all know must leave its permanent traces both physically and mentally.

The expression of such opinions by men of the exalted standing of those to whom I refer must carry great weight, and the said opinions are obviously, at least to one who has successfully used N_2O and O, not based on fair observation.

Therefore I trust I may be pardoned for my forwardness in offering you this report of my experience as one of the class who are accused of having made patients harder for the man to work on who has not mastered N_2O and O. There is no doubt in my mind that 5 per cent. of success is a good average for the man who is learning the technique of administration. It would appear that the principal reason why so many condemn analgesia is that they do not give themselves time to master it, but base their opinions on their own results while they are still unskilled, and discard the practice. There is, I feel sure, no anesthetic in use which requires more care and skill to get the best results than N_2O and O, but the dentist who will devote the time and thought necessary to master it, if he be adapted to the work, will be fully repaid for his trouble. I have been using N_2O and O for both analgesia and anesthesia continually and extensively for about three years, and would not care to continue the practice of dentistry if I had to go back to the old painful work. For some months my results were far from satisfactory, on the whole, but I assure you I am conservative when I say that I am now having at least 85 per cent. of my cases go

through perfectly satisfactorily both to myself and patients.

In conclusion I will say that I have yet to see a single case in which there was any evidence of injury, mental or physical, and I doubt if any dentist who has been in practice any length of time can say as much in regard to the old method of subjecting one's patients to unmitigated pain.

Very truly yours,

J. NEALES.

PROVIDENCE, R. I., November 11, 1914.

THE ARMY DENTAL SURGEONS CORPS.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—From time to time, and again in the December number of the DENTAL COSMOS, I find references to the army dental corps. Can you tell me or ascertain for me what attracts men to service in the army dental corps? What is the exact nature of the services they are called upon to render? Do you find men who have been several years in practice entering the army dental corps as acting dental surgeons? Last April, I believe, there was a competitive examination for acting dental surgeon in the United States army; if I remember correctly, there were about twenty-eight vacancies. How many were filled? and how much practical experience individually have the successful candidates had before the time of their examination?

I think the answers to questions like these will go far toward explaining the position or status of the army dental surgeon, and at the same time will enlighten many dentists who may have had or have a desire to join the army dental corps.

Yours truly,

PHILIP SCHEIMAN, D.D.S.

NEW YORK, December 7, 1914.

PROCEEDINGS OF SOCIETIES.

PENNSYLVANIA STATE DENTAL SOCIETY.

Forty-sixth Annual Meeting, Philadelphia, June 30, July 1 and 2, 1914.

TUESDAY—*Morning Session.*

THE forty-sixth annual meeting of the Pennsylvania State Dental Society was called to order on Tuesday morning, June 30, 1914, at 10 o'clock, in the Clover Room of the Bellevue-Stratford Hotel, Philadelphia, by the president, Dr. H. S. Seip, Allentown.

Rev. EDWIN HOWARD ROMIG, Philadelphia, Pa., invoked divine blessings on the deliberations of the association.

Dr. RICHARD HARTE, director of public health, welcomed the association to the city of Philadelphia.

Dr. EDWIN T. DARBY, Philadelphia, responded to the address of welcome on behalf of the society.

Dr. S. P. Cameron, Philadelphia, was called to the chair, while the president, Dr. SEIP, read his annual address, as follows:

President's Address.

By H. S. SEIP, D.D.S., Allentown.

I bid you welcome to this, the forty-sixth annual meeting of the Pennsylvania State Dental Society, and take this opportunity to express to you my deep appreciation of the great honor you have conferred on me by making me your president.

THE MEETING'S PROGRAM.

In this age, when everything is gaged by efficiency, I shall confine myself to the things that pertain to our State Society. I certainly voice the sentiment of every member present when I express to the chairmen of the program, clinic, local arrangements, and exhibit committees, and the members thereof, our heartfelt thanks and appreciation of their labors in our behalf, as evidenced by the splendid program they present to us for this meeting.

I wish to say as an explanation to the society that, by our special request, the papers on "The Vaccine Therapy in the Elimination of Mouth Infection" will of necessity be long, because we particularly asked that the essayists should go into every detail, so that every dentist might be in a position to understand what this new movement really means.

In the light of our newer knowledge concerning the effects of mouth infection as a cause of systemic disease, the auto-infection caused by toxemia of the intestines must pale into insignificance. In fact, there is now no room for doubt that the elimination of pyorrhea from the gums will add many years of life and happiness to every man, woman, and child in the community.

PROPOSED CHANGE IN DATE OF MEETING.

This brings me to the first recommendation I have to submit to your consideration. I fully realize that it will require the change of our charter—but what of that, if it is within the line of progress?—that is, to change the time of our meeting to some other period of the year. We meet too near to the time of the National Dental Association's meeting, which renders it difficult for your committees to secure papers and

clinics. The month of June is a very busy month for the colleges, and we certainly want the benefit of the presence of all the faculties of our dental colleges, and it comes just when every dental practitioner is busiest getting his patients ready to go away for their vacations.

CHANGE IN NOMINATION OF OFFICERS PROPOSED.

My observation has led me to the conclusion that the operation of the machinery of the Pennsylvania State Dental Society is wofully defective. Men who have rendered comparatively no services to the society are advanced to positions of trust, and others, who have given years of faithful and efficient service, are passed by or kept on our committees continually, which is all wrong, and does not make for efficiency, the cry of the age. This is due to our governmental system—the Councils who nominate the officers and appoint the committees. They meet between sessions, and consequently the time is limited, when much time should often be given to certain subjects—and they even often delay the regular session. The greatest delay occurs when the nominations must be made. In order that we may overcome this difficulty, and bring our component societies into closer touch with the State Society, I would recommend that the Councils shall put in nomination for the state board of dental examiners the presidents of the different component societies of the state; that the State Society put in nomination for members of Council the secretaries of the different component societies of the state; that the Council then appoint the committees of the State Society from the officers of the different component societies of the state. Thus we will have all the officers in continual touch with each component society, and they will be able to keep up and increase our membership. This may require a change in our constitution and by-laws, but if we consider it in regard to efficiency, it is our duty to make the change. I would recommend that the secretary be elected for five years, at a salary of $700 per year, to attend to the interests of the society and the enforcement of the dental law, and that he be provided with a stenographer at a salary of $500 per year, to assist him and the chairmen of all the committees of the society in the furtherance of their work and the preparing of the program for each meeting. It is no longer feasible or practical or conducive to efficiency to expect a man in active practice to give of his valuable time to serve either on the program, the clinic, or the exhibit committee without some assistance, which such a stenographer could very ably render after having once gone through the work. There is considerable money expended each year by the various committees which would practically provide the salary of the stenographer.

THE EXHIBITORS.

We have been justly proud of the exhibitors' display at our Pennsylvania meetings. The exhibits are truly an educational feature, as they show us everything new in the way of office equipment, and all dentists who are progressive want to see the latest things the manufacturer has. This feature should be conducted on business principles, which would be fair both to the society and the exhibitor. I would recommend that a definite part of the expense of each meeting should be borne by the exhibitors, viz, the expense of the hall and meeting-room and fifty per cent. of the expense of the clinicians and essayists. Twenty per cent. of the amount decided on by the society to be expended in advertising the meeting should be used in favor of the exhibitors. If the meeting is held east, notices should be sent to every dentist in eastern Pennsylvania, New Jersey, Delaware, and eastern Maryland; when it is held west, notices should be sent to every dentist in western Pennsylvania, eastern Ohio, western New York and West Virginia. This would be done to reimburse the exhibitors for being charged a definite share of the expenses of the meeting.

PUBLICITY COMMITTEE PROPOSED.

I would recommend that the duties of a publicity committee be added to that of the local arrangements committee; that they shall communicate with every component society of the Pennsylvania State Dental Society, and secure a true list of every ethical practitioner in the state, and that stencils be provided for the secretary's addressing machine, and that a certain amount of our literature be sent to every ethical dental practitioner in the state. This will aid in increasing our membership.

The *Bulletin* should be sent monthly, beginning with October, and contain a reprint of one of the papers read at our previous meeting, and other matters of interest. This should go only to the members, thus gradually helping to bring in to the State Society all the ethical dentists of the state.

It should be the duty of this publicity committee to bring to the attention of the public the facts emphasized in our program this year—for only by the education of the general public in the things pertaining to dentistry, and by publication of what we are doing, can we hope to bring the people to the full realization of the importance of their giving attention to dentistry, and thus making themselves more efficient.

NECESSITY OF ORAL HYGIENE SERVICE.

It is conceded that a dentist can comfortably take care of four hundred patients in a year. There are 18,009,891 school children in the United States; ninety per cent. of these children's teeth are neglected. There are 41,117 dentists in the United States, whose entire time could be taken up by the neglected school children's teeth, leaving the balance of 82,000,000 population entirely without the possibilty of any dental attention! Fellow members of the Pennsylvania State Dental Society, these figures are simply staggering from an economy and efficiency standpoint. Our responsibilities to the state in regard to education and work are appalling, for upon our shoulders rests all the care of this generation, and it is our duty to make the state see this, and realize the loss in efficiency in the cases which are not reached.

ORAL HYGIENE IN GIRARD COLLEGE.

We in Pennsylvania can be justly proud that through the efficient presidency of Dr. Cheesman A. Herrick, Girard College, one of the magnificent charities in our midst, has established dental, medical, and rhinology departments—the dental department under the splendid management of the chairman of our Program Committee, Dr. S. P. Cameron, who with two assistants and a mechanical assistant is rendering the very best dental services to his wards. There is probably no other institution in the world that is doing for its wards from an orthodontic and operative and preventive dental standpoint what Girard College is accomplishing. Since their mouths have been put in a healthy condition, the general health of the boys has improved wonderfully.

DENTAL NURSES.

Owing to the mighty movement of oral hygiene, and the foregoing statistics as to the inability of the dental profession to take care of the pressing necessity for the treatment of dental caries and irregularities, I recommend a change of our dental laws, so as to provide for the licensing of dental nurses, whose province it shall be to assist the dentist, and who shall be permitted to give prophylactic or surface treatment of the teeth, etc. Suitable courses of instruction could be provided by our dental colleges, and the services of these nurses utilized while they are taking the course at the chair and clinic, as are the services of the medical nurses at our different hospitals. We could then utilize them in our public school work, as suggested by Dr. Alfred C. Fones in his report as chairman of the Oral Hygiene Committee of the National Dental Association—"The source of unclean mouths and decayed teeth is found in the first five grades of our public schools; how are we going to check it?"

The work of instructing these children as to the use of the brush and the surface treatment of the teeth once a month could be taken up by these nurses under the direction of competent dentists in each school district, systematized as the doctor suggests. Each set of nurses would advance with each grade of pupils, and the new nurses would take the first grade each time, until the five grades were supplied with dental nurses. This would insure for each child the proper care of his teeth and proper education regarding cleanliness and hygiene for the first five years of school life, which is the period when the teeth are most susceptible to caries.

EXAMINATION OF SCHOOL CHILDREN'S MOUTHS BY DENTISTS.

This brings me to a recommendation which will require a change in our school code, and that is the request of the Lehigh Valley Dental Society to the State Dental Society, that it endeavor to have our school code so changed that a competent ethical dentist be employed to examine the teeth of our school children—the good effects of which will be patent to all of you without further comments on my part. But while this effort is made, we should endeavor to have the employment of the dental nurse also incorporated. It would result in the betterment of the children, and there would be a smaller percentage of children compelled to review their grades, and the saving to the state would far outbalance the added expense to each school district. If all the facts were brought to the attention of the proper parties, there ought be no difficulty in accomplishing our object.

CONTROL OF PROPRIETARY PREPARATIONS IN SCHOOLS.

At the suggestion of the Nestor of our profession in Reading, Dr. W. H. Scholl, I would call your attention to the various proprietary materials on the market, which are advertised by free distribution in our schools, etc., and to the fact that we do not always know whether they are beneficial or not, and while we are educating the public as to oral hygiene it is our duty to see that they are properly informed in this respect. I would therefore recommend that a committee be appointed to make proper investigation, with the aid of a chemist if necessary, and a report be made at our next meeting as to their findings.

LENGTHENING OF THE DENTAL COURSE PROPOSED.

I am constrained to make my next recommendation because of the fact that the general public and the medical profession, owing to the demonstrated relationship which mouth infections bear to general bodily diseases, which we will have so ably demonstrated at this meeting, demand that we, as a profession, give them relief from these conditions. This means that a larger educational preparation must be provided. I shall not go into detail, as time will not permit, but when we realize that the dental schools are already assigning 1200 hours per year, when the available hours of eight-hour days, Saturday afternoons excepted, is only 1400 hours, and that the academic student's maximum is only 600 hours per year, engineer's not over 700 hours, medical student's about 1100 hours, it can be readily seen that the dental course is at the breaking-point. We all concede that the present course cannot be curtailed, consequently the only conclusion left us is a lengthening of the course; and I would recommend a change of our dental law, to read: "The degree of Doctor of Dental Surgery, or other established dental degree from a reputable educational institution maintaining a *four* years' course in dentistry." I am convinced that many a man who goes through his dental course fails before the board because he has too much crowded into too short a time in his course. The object of education should be not to reach the quick and smart boys, but those who, though they be not as quick, if given the proper attention will make just as useful men in the profession. The present trend in all education is to crowd too much

into too short a time. True, it eliminates the weak, but is that not, after all, the object of education—if we wish to contribute to the general uplift of all classes?

MEMBERSHIP IN NATIONAL DENTAL ASSOCIATION.

It is a matter of regret, when we consider the position which the Pennsylvania State Dental Society holds among the states of the Union—this state having always held the foremost place in dentistry—that we should have but 390 of a total number of practitioners of over 1000 who have voluntarily become members of the National Dental Association. I would therefore recommend that an amendment to our by-laws be presented at this session making each member of this society a member of the National Dental Association.

DENTAL RELIEF AND SCIENTIFIC FOUNDATION FUNDS.

I especially commend to you the Dental Relief Fund, and the Scientific Foundation Fund of the National Dental Association, and would say that the subscription to the latter fund from the State of Pennsylvania is far below our quota. I shall take special pleasure in allowing Dr. Grieves, one of our essayists and a member of the commission of the National Dental Association, to present the cause of this foundation before one of our sessions.

In bringing these remarks to a close, I can find no more fitting words to urge us on in our endeavor to work out the great problems before us, and to emphasize the need of conscientious endeavor in serving the present generation in our chosen calling, than the lines of the poet:

When Earth's last picture is painted, and the tubes are twisted and dried,
When the oldest colors have faded, and the youngest critic has died,
We shall rest—and, faith, we shall need it!—lie down for an æon or two,
Till the Master of all Good Workmen shall put us to work anew!

And those that were good shall be happy; they shall sit in a golden chair;
They shall splash a ten-league canvas with brushes of comets' hair;
They shall find real saints to draw from—Magdalene, Peter, and Paul;
They shall work for an age at a sitting, and never be tired at all!

And only the Master shall praise us, and only the Master shall blame;
And no one shall work for money, and no one shall work for fame,
But each for the joy of working, and each, in his separate star,
Shall draw the Thing as he sees it, for the God of Things As They Are!

Dr. Cameron appointed the following Committee on the President's address: Drs. W. D. DeLong, H. E. Friesell, and F. D. Gardiner.

Motion was then made and carried to adjourn until the afternoon session.

TUESDAY—*Afternoon Session.*

The meeting was called to order by the president, Dr. Seip, at 2.30 o'clock Tuesday afternoon.

The President announced as the first item on the program for the afternoon session, the reading of a paper by Dr. A. PARKER HITCHENS, M.D., Glenolden, Pa., entitled "Rationale of the Use of Bacterial Vaccines in Pyorrhea Alveolaris."

[This paper is printed in full at page 1 of the present issue of the COSMOS.]

Dr. JOSEPH HEAD then read a paper entitled "Vaccine Therapy in the Elimination of Mouth Infection."

Discussion.

Dr. ARTHUR H. MERRITT, New York, N. Y. I feel not a little embarrassed in appearing before you this afternoon, for I observe that I am to speak to you about "The Uses of Vaccines in the Treatment of Pyorrhea," when, as a matter of fact, I am not going to talk about their use, but about their *uselessness.*

I am further embarrassed because I

find myself in complete disagreement with my friends Dr. Head and Dr. Hitchens, both of whom I hold in the highest esteem. They may be right in their observations, and I may be wrong in mine, but there is one thing in which we are all equally interested, and that is, in arriving at the truth.

The therapeutic value of vaccine therapy in the treatment and prevention of certain infections is beyond question, notwithstanding the fact, conceded by those best qualified to judge, that its failures are more numerous than its successes.

Like every great discovery, vaccine therapy has had its enthusiastic advocates whose use of it has not always been as discriminating as it should have been. There is nothing strange in this, since this is the history of every discovery made in medical science. There are always sure to be those who will make a fad of any innovation. This has been especially true of vaccine therapy; there is something in the psychology of germ inoculation which strongly appeals to physician and patient alike. In short, it has become fashionable, with the result that the wide use which is being made of it is in part due to the forcing of the physician's hands by his patients. There can be no doubt that a large amount of vaccine therapy is, in consequence, of the most discursive and slipshod kind; so desultory and unsystematized is it that it can have no place in estimating the value of the method in the treatment of disease. I believe a warning should be sounded in every place where medical and dental men gather against this indiscriminate use.

A fact which should never be forgotten is that, while the principle of vaccine therapy is correct, it is not a panacea for every ill; in reality, it has only a very limited application. As has been said by a recent writer, "It is as though one wandered up and down a long passage into which many locked doors opened, carrying a key, and trying the doors with it. Many refuse to open; the key does not fit. Then there comes one where the key turns smoothly, and the door opens easily. This accurate fitting of lock and key illustrates the specific stimulus and response of a vaccine given in a successful case." The lesson to be learned from this is that the key does not always fit; in fact, more often it does not.

My own use of vaccine has been limited to the treatment of pyorrhea, begun in 1907 with high hopes that it would prove a valuable adjunct in the treatment of this most chronic of localized infections. I have always used it experimentally—*i.e.* in selected cases—and under varying conditions, with a view to ascertaining just what place, if any, it had in the treatment of pyorrhea. I accordingly used it prior to the usual local treatment, during such treatment, and after treatment had been discontinued. As a result I have seen the subjective symptoms clear up, with some improvement in the disease itself, and this independently of other treatment. In no single instance have I seen more than this; there has never been any permanent improvement. When combined with local treatment, I have not been able to see that it appreciably influenced results. As a post-operative treatment it is unnecessary so far as the disease itself is concerned, if the local treatment has been thorough, and it will avail nothing if it has not been so, as I will show later.

I frankly confess to being disappointed, not because my preconceived notions have not been realized, but because an expected aid has not been forthcoming.

This is not surprising, however, when we realize that the success of vaccine therapy depends upon the isolation and employment of the germ causing the disease. So far as is at present known, pyorrhea is not caused by a specific germ; the infection which takes place is a secondary one, without doubt a serious complication, giving to the disease its characteristic symptom of pus discharge, and being largely responsible for its unfortunate influence upon the health and well-being of the patient. To treat such a disease with vaccines would therefore consist in the treatment

of symptoms, justifiable no doubt under certain conditions—and in that instance explaining the improvement in symptoms, but explaining also its inefficiency as a curative agent. In spite, therefore, of the high hopes with which I began the use of vaccines seven years ago, and with which I have continued it in selected cases to the present time, I am forced to the conclusion that it has a very limited place in the treatment of pyorrhea.

Without entering into the question, at this time, as to whether pyorrhea is or is not a purely local disease, the fact remains that it can be cured by local treatment, though the question of diet, elimination, hygiene, etc., should in every case be considered. Where this has been done, and the surgical work has been thorough, there can be little need of vaccines, and to subject a patient to such inoculations before it has been proved that the usual surgical treatment is unavailing, is in my opinion unwise.

When, as a result of a long-standing pyorrhea, there is evidence of a general toxemia, or when for example there is a chronic arthritis, vaccines may prove valuable, though it is surprising how often these systemic expressions of pyorrhea clear up of themselves by the removal of the original focus; a fact which may be explained not only by the removal of the cause, but by the auto-inoculation which undoubtedly takes place through local treatment, whereby the patient's resistance to infection is increased. The use of vaccines in such cases would therefore apply to the elimination of diseases produced by the original focus rather than to the pyorrhea itself.

In all that has been said and written about pyorrhea and its treatment, there are a few facts which should not be overlooked in any effort to arrive at the truth:

(1) That pyorrhea can be and is being cured by surgical methods alone —the first essential being thoroughness.

(2) That the most enthusiastic advocates of vaccine therapy do not claim that it will of itself cure pyorrhea.

(3) That there is not a vestige of proof that pyorrhea which has not yielded to surgical treatment can be cured by vaccines.

(4) That the claim which is frequently made by the advocates of vaccine therapy that its use will prevent recurrence is only an assumption. There is no proof that this is so.

In an article which appeared in the *Lancet* for February 7, 1914, by H. D. Rolleston, entitled "Vaccines from the Standpoint of the Physician," the following statement is made—which very clearly expresses the attitude of the conservative physician regarding vaccine therapy:*

> Curative vaccine treatment must be admitted to have disappointed the high hopes with which it began, and in this respect its history resembles that of most remedies. The problem of immunity is so complex that it is highly probable that the technique or practice rather than the principle of vaccine therapy is at fault, and that in time this may be so perfected as to establish the position of vaccines as a reliable remedy. The determination of the infecting micro-organisms is exposed to well-known fallacies and may be very difficult. Even with all due precautions a wrong vaccine may be given and do harm. . . . Possibly the conditions of culture on artificial media may so modify the products of the micro-organisms of which the vaccine is composed as to render artificial inoculation far inferior to auto-inoculation. It has therefore been suggested that vaccines should be made from organisms grown on blood or other natural media. . . .
>
> In chronic local infection of various kinds, such as arthritis and colitis, in which gradual improvement follows vaccine therapy, it is very hard to decide whether the credit is due to the treatment or to nature unassisted.

At the present time, the results of vaccines are so uncertain that their use appears to be justified only when other and more trustworthy therapeutic methods have failed, or do not exist.

Dr. C. P. Brown, Philadelphia. There is one point to which I wish to call particular attention. Most bacteri-

* I am indebted to Dr. A. M. Nodine and Dr. William R. Williams for calling my attention to this article.

ologists who have investigated this disease have used either plain agar or Loeffler's blood serum. Goadby used nothing but plain agar, and was successful in isolating practically nothing but streptococci, staphylococci, and yeasts. Medalia of Boston used plain agar and Loeffler's blood serum for his first isolations; he used blood agar only to ascertain whether or not a streptococcus produced hemolysis; he isolated staphylococci and pneumococci. So many micro-organisms fail to grow on plain agar and blood serum that these media are insufficient for work of this kind. In the study which Dr. Head and I reported in the Section of Stomatology at the meeting of the American Medical Association in Minneapolis, we used blood-agar plates for every case. Our results show clearly that certain organisms are nearly always present in pyorrhea.

Dr. J. C. Hertz, Easton, Pa. I would like to ask if anyone experienced in the use of vaccines has found any rise in the bodily temperature in the reactions to the various injections.

Dr. C. S. Tuttle, Philadelphia. It has been a great pleasure to me to listen to Dr. Hitchens and Dr. Head, as I have only recently become interested in the treatment of pyorrhea by the vaccine method. In telling of one success I had, among several others, I will relate a story that can be verified by Dr. Head, because he saw the beginning and the ending of the case. The patient, a man of the alcoholic type and good physique, presented himself for the treatment of four teeth which served as abutments for bridges and which were affected with pyorrhea. After having treated him locally in a manner which I considered thorough, and having opened the gums so that two abscesses could discharge, I had entire failure.

Dr. Head. How long was the case treated locally?

Dr. Tuttle. It was treated locally for six years, and I barely managed to keep the abutments in position during that period. Then I became interested in vaccine therapy through the patient himself, who had been acquainted with a man who was doing a great deal of this work, a physician, however, and one who had not had a great deal of experience with vaccine therapy as far as dentistry is concerned. In considering the advisability of treating the case by means of vaccine therapy, I felt, because of the fact that I have no medical degree, that I would like to place the responsibility of the inoculation upon a physician. The patient suggested Dr. R. V. Patterson, who said to me, "Before we take up the work: If this case is cured, and you would consider it cured, and other men who understand this work would consider it cured, will you attribute the cure to the vaccine?" I said I would. I had arrived at the point of extracting the teeth, and was on the verge of sending the man to an exodontia specialist, and would have considered my conscience clear if the teeth had been extracted. We, however, decided to try the vaccine treatment, and the first thing to do was to remove the bridge; the removal of the bridge was indicated, as there was a large swelling suggesting an alveolar abscess. I drilled into the pulp chamber expecting to find a dead pulp, but found a vital one, which showed that it certainly was a clear case of pyorrhea.

Someone asked about blood pressure. We took the blood pressure in this case at various times during the treatment. We started with a ten million inoculation, and the dose was gradually increased until the patient received the maximum of twenty-one millions, and at no time did his temperature go up, and at no time was there a change of more than two points in blood pressure. Taking into consideration that the blood pressure varies on different days and at different times of the day, even this could not be attributed directly to the inoculation. This patient took twelve or fourteen inoculations, and in spite of the fact that he continues the use of alcoholics and has no regular hour for retiring, these bridges have remained firm since they were replaced.

Dr. Joseph Head, Philadelphia. I

wish to state that I do not know of any man in the whole profession for whom I have greater respect in regard to his scientific ability and general ability as a dentist than Dr. Merritt; but now we have come to a point where I believe that I am rather optimistic, while he is pessimistic. Perhaps my optimism may be turned into pessimism as time goes on. I can only say that, for over ten years, I strove to treat pyorrhea and did it successfully, and was of the opinion that pyorrhea could be cured, if one calls controlling a cure, but Dr. Merritt says that by six weeks' treatment he is able to cure pyorrhea cases so that there will be no recurrence. Now, I am going to say that Dr. Merritt has shown me several cases, particularly the one case cited in which the tooth was exposed almost to the tip and abscessed—and in that case I should have opened the tooth and extirpated the pulp. I cannot get rid of abscesses without taking out infected pulps, but he does not seem to have had that difficulty. He is able to cure these cases in six weeks or two months with apparently infected pulps remaining in the teeth. I will say, however, that in my cases which I have striven to bring under control, and in which I was unable to do anything after treatment for two or three years, I have with vaccine treatment in the course of six months seen most profound improvement, more than I had had at any time previous. It has also been my experience that after the use of vaccines for from three to six months to a year sometimes there is a general improvement in the condition of the tissues of the mouth. In patients whose gums are easily inflamed and have an apparently slight hold on the teeth, without any other treatment there has been a tremendous increase in the tightening and healing of the gums. This is my feeling; I may be wrong, and Dr. Merritt may be right. Before I began using the vaccine treatment, I treated many cases surgically, and in many cases had a fair amount of success and was considered to be a pretty good dentist by some. But I can only say that, since I have been treating these cases by vaccine treatment, I have been able to make people comfortable where it could not possibly be done before, and I am convinced that proper surgical treatment aided by vaccine therapy—but in contact with the tissues around the teeth—gives a result that is impossible without the vaccine treatment, no matter how careful and how valuable that local treatment may be.

Dr. Hitchens (closing the discussion). It has been a great privilege to listen to Dr. Merritt this afternoon. Those of us who are incarcerated in the laboratory most of the time and are consequently not so familiar with the application of the things in which we are so much interested, are always anxious to hear the clinical side of the question.

Dr. Merritt's experience coincides so exactly with what our theories would lead us to expect that what he has said would be difficult to discuss, were it not for the fact that I am inclined to draw slightly different deductions. If, as Dr. Merritt has reported, systemic improvement follows treatment with bacterial vaccines, we must believe that the systemic condition was due to bacteria; and the improvement must have depended upon some influence antagonistic to the bacteria. That is to say, the bacteria involved in the process of infection so located that they could be readily acted upon by the ferments were destroyed. Those bacteria ensconced in the tissues, as I have indicated in my paper, could not be reached by the specific ferments, and therefore were probably not affected—only their products could be influenced in any way. The only way these protected bacteria can be reached is by the method Dr. Merritt used. He cut directly down upon the infected area, as I understand it; if there was infected tissue he removed it; any foreign material that might complicate healing or assist the infecting bacteria was removed. Dr. Merritt treats pyorrhea according to the principles of vaccine therapy. Bacteria that cannot be reached by specific ferments resulting from vaccine treatment

should, whenever feasible, be removed surgically.

As to Dr. Merritt's disappointment in the general system of vaccine treatment, there are certain points in his method of procedure that the bacteriologist would like to be assured upon. Of course, he did not go into the bacteriological aspect of the subject, but it seems to me that if there has been any systemic improvement it is a testimonial in favor of vaccine, and if there has been any improvement from the local treatment, I would wonder if it did not come about as a result of the influence of the treatment upon bacteria that were present locally. As I said in my paper, if bacterial vaccines are injected, they form specific ferments, and if these specific ferments are brought in contact with the infected area, improvement results. Of course that is where the whole trouble lies; in conditions like this, the bacteria cannot be reached without surgical interference.

The meeting then adjourned until the evening session.

TUESDAY—*Evening Session.*

The meeting was called to order on Tuesday evening at 8 o'clock by the president, Dr. Seip.

The first item on the program, as announced by the President, was the reading of a paper by Dr. J. CLARENCE GRIEVES, Baltimore, Md., entitled "The Relation of Dental Septic Conditions to General Disease."

[This paper is in substance the same as the paper by Dr. Grieves which appeared in the DENTAL COSMOS for January 1914, vol. lvi, page 52.]

The next paper on the program was one by Dr. W. J. ROE, Philadelphia, entitled "Surgical Lesions Due to Oral Sepsis, and Their Treatment."

[This paper will be published in a later issue of the DENTAL COSMOS.]

The next item on the program was a lantern lecture by Dr. A. H. MERRITT, New York, on "Pyorrhea Cases and Root Amputation in Cases of Blind Abscess."

The next order of business was the reading of a paper by Dr. M. T. BARRETT, Philadelphia, entitled "The Protozoa of the Mouth in Relation to Pyorrhea Alveolaris."

[This paper was printed in full in the August 1914 issue of the DENTAL COSMOS, vol. lvi, page 948.]

Discussion.

Dr. A. W. STRECKER, Philadelphia. I have been treating pyorrhea for about ten years, following the system advocated by Dr. D. D. Smith, and have obtained some very good results. A few days ago Dr. Sausser called me on the phone and asked if I could not send a case to Dr. Barrett for treatment. I sent a case to Dr. Barrett, and he treated it three times, and I must say that the results were remarkable. The tissues at once cleared up in a manner that I was unable to bring about in any other way.

Dr. E. R. SAUSSER, Philadelphia. I wish to corroborate some of Dr. Barrett's clinical observations in the treatment of this suppurative condition. A few weeks ago, Dr. Barrett told me that he had found a parasitic micro-organism in pyorrhea cases, and I immediately became interested and offered to co-operate with him and send him a few cases for treatment in which I had failed to produce a cure. I selected five cases—three of the anemic, underfed class, with no assimilation whatever, and of the chronic toxic type. In all these cases Dr. Barrett found the amœba. One of the other cases was that of a robust woman who had pyorrhea; this had been under control, so we thought, for about twenty years, but the amœba was found present. The fifth case was that of a man suffering with a lesion of the liver, no doubt, with attacks once a month, and in his case amœbæ of gigantic proportions were found. The last case I treated myself, following the ordinary cleansing procedure, and then drying the pockets thoroughly and putting a

one-half of one per cent. solution of emetin hydrochlorid into the bottom of the sockets of the lower anterior teeth, which were mostly affected, and allowing that solution to remain under the protection of cotton rolls for a few minutes, following this application with thorough massage. I saw the case two days afterward, and I can testify that macroscopically there was no pus present, although this case had been showing a suppurative condition from the first treatment. Of the three cases which Dr. Barrett treated, one was especially interesting in that the patient had suffered with pyorrhea for about fifteen years, and her mouth was a picture so far as exquisite oral toilet is concerned, she being continually under the care of a dentist who kept her mouth clean; but there had always been a flow of pus, although I could never find any deposits of any kind that I could identify as serumal or salivary, but a sort of mushy deposit which we possibly do not know anything about at the present time. In that case, twelve teeth were extracted, and pyorrhea still persisted, pus flowing from the gums. The upper left lateral was treated five times, and after the third treatment that livid tendency of the tissue disappeared, the pockets disappeared, the flow of pus diminished, and the tissue cleared up satisfactorily; but there is still a little pus. However, that is not to be wondered at, considering the long-standing and insidious nature of the case. It has been very interesting to me to see that mushy pus clear up, and I fully believe that Dr. Barrett will succeed in reducing the condition to a satisfactory status, if the present progress continues.

In the case of the robust woman who had been having her teeth treated for about twenty years, the patient was most enthusiastic over the treatment. Previously she complained very much of the treatment, and did not recover from it for three or four days afterward. Just the mere massaging of the gums would cause considerable pain around the necks of the teeth. Her statement after the first treatment was, "My teeth have been feeling different since I had that treatment." She said that she could bite much better than before, which to my mind was an indication of improvement in the peridental tissue.

Whether or not emetin is a specific, or whether or not the amœba is the vital cause or a secondary condition in pyorrhea, it is most interesting to us to see these destructive conditions clear up after such short treatment.

Dr. Allen J. Smith, Philadelphia. My personal interest in the work presented by Dr. Barrett has been primarily from the standpoint of parasitology, and were I to follow my inclinations, my remarks would cover more fully the description and mode of identification of the organisms which we meet in these oral lesions. But realizing that your members are more likely at this time to wish for general comments, particularly in the matter of treatment, I will forego for the present any technical zoölogical references.

Probably many of my hearers recall the fact that Dr. James Truman advocated and used with effect local applications of quinin in pyorrheal pockets. Like emetin, quinin is, perhaps in a minor degree, an amœbicide, and has been used not infrequently in rectal injections in the treatment of amœbic dysentery. While perhaps Dr. Truman did not at the time realize its mode of benefiting the lesions, in retrospect we may now feel that quinin did so by directly affecting not the bacteria of the pockets, but the amœbæ present there. It is from the effect exerted by these known amœbicides that we may infer the pathogenic importance of these protozoa. It is impossible, as has been brought out in Dr. Barrett's paper, to declare that these parasitic amœbæ are the sole cause of Riggs' disease, but in my opinion he has offered sufficient evidence to permit at least the declaration that they are pathogenic. By analogy, in amœbic dysentery and in abscess of the liver secondary to amœbic dysentery, the problem of the relative importance of the dysenteric amœbæ and of bacteria has also been proposed, and is still

a matter of discussion; *i.e.* whether the endamœbæ are the essential causative agents or whether they act mainly as conveyers of bacteria which they have ingested, from the surface of the colon into the tissues of its wall to produce the characteristic ulcers, and into the liver to produce the abscess of the latter organ. The recently determined but widely proved fact that emetin destroys the amœbæ and is followed by healing of the lesions does not exclude the associated bacteria from a part in dysentery, but it unquestionably does show that the amœbæ perform an important part in the process. In the same way, from the fact that injection of emetin into pyorrhea pockets is followed by cessation of the suppuration and disappearance—as far as has been determined—of the endamœbæ, I believe we are justified in holding that these protozoa have an important part in the process. Yet from the fact that they carry with them bacteria, it is impossible to say that the latter are not also of etiologic importance; therefore we may well have to deal secondarily with the bacteria, and thus have reason to continue the usual antibacterial measures, including vaccine therapy, in dealing with the whole problem. Doubtless there will be found a number of cases which will not completely respond to the amœbicide, and in such it will be found necessary to use, in addition to the emetin, local antiseptic applications, or complete the treatment by the employment of vaccines. Possibly, too, there are cases in which amœbæ are not the responsible agents. Just as we recognize dysenteries as being of different types from an etiologic standpoint—as amœbic dysenteries, bacillary dysenteries, toxic dysenteries, etc.—there is no reason why we may not find different kinds of pyorrhea; and I would be surprised if, in future experience, Dr. Barrett should find that every case of pyorrhea treated by him responds with the same promptness that these thirteen cases have shown.

Perhaps the dental profession may not appreciate the prediction I am about to make, because of its unfavorable bearing upon the dental practitioner and his earnings. Emetin when used in the treatment of dysentery is usually introduced hypodermically, and the drug injected under the skin of the arm is efficient in killing the endamœbæ of the colon. It will probably prove effective also in cases of pyorrhea if administered hypodermically; and should it become generally accepted that the hypodermatic injection of a quarter of a grain of emetin into the arm will take from the dentist's office patients who have been in attendance, perhaps, for years, the dentist's source of income is likely to be materially impaired. These, however, are apt to be the lines along which progress in treatment will proceed.

This report by Dr. Barrett must be accepted as merely a preliminary statement of the work we have taken up. In brief *résumé,* the facts thus far presented are that in the examination of material from pyorrhea pockets of forty-six persons, endamœbæ have been found in all cases, without a single exception; that in seven cases which were found free from peridental suppuration, no endamœbæ were found anywhere in the mouth after a prolonged microscopic search of scrapings; and that in thirteen cases treated with a known amœbicide in the form of the hydrochlorid of emetin, immediate response has followed the use of this amœbicide.

It would probably be of interest to you to be told that our knowledge of the amœbicidal action of emetin is in a measure due to one who received his medical education in this city. Dr. E. B. Vedder, a surgeon in the United States army, is a graduate of the University of Pennsylvania of whom we should be proud. While stationed in Manila, in the course of study of the old ipecac treatment of dysentery, he found that the success of this treatment coincided with the amount of emetin in the particular sample of ipecac employed, and on trial found that solutions of emetin are highly lethal to cultured endamœbæ *in vitro*—(not to take up the question whether the amœbæ in the culture used were true examples of

parasitic amœbæ or forms of non-parasitic type which had passed through the alimentary canal in an encysted condition). Colonel Rogers of the Indian medical service applied these findings of Vedder's to actual practice, first administering emetin in 1912 to cases of amœbic dysentery; and his happy results in the few cases first subjected to the remedy have rapidly been confirmed over the whole tropical world. Emetin is recognized today as practically a specific in amœbic dysentery and the amœbic complications of the disease. It is said, too, to be of value in other conditions, as in stopping pulmonary hemorrhage, in the treatment of Japanese schistosomiasis, and to have some effect upon syphilis, although much less than "606." The remedy is, if our results be sustained, of great value in pyorrhea, and, as yet a comparatively new agent, will in time probably be found of value in a variety of other pathological conditions.

Dr. C. J. Grieves, Baltimore. I can only thank you for your courtesy this evening. There is one thought which has come to me in connection with this work, and which was suggested to me through the clinical observations reported by Dr. Sellers, who knows of Dr. Vedder's work, and through whom I have heard a little of it. Dr. Sellers mentions the fact that when the first volunteer regiments went to the Philippine Islands, amœbic dysentery and pyorrhea alveolaris had a great deal to do with decimating their ranks, according to the reports of those who came back. Now, whether there is anything in the suggestion that, considering the disturbed metabolism, intoxication, the diet as customary in that country, and the hot climate, the amœba is present in pyorrhea following dysentery, I do not know, but I shall go home and take this matter up with somebody who knows something about the amœba.

Dr. W. J. Roe, Philadelphia. This is a distinct revelation to me, and I am personally indebted to Dr. Barrett and Dr. Smith for their timely revelation. It is apparent to all of us that the only safe mouth is a perfectly healthy mouth, in the true sense of the term, viz, one with no devitalized or diseased teeth or gums. This object the dental profession, the medical profession, and the public should strive to attain, and this is the only condition in which any of us can feel perfectly safe, because, as Dr. Grieves has shown us tonight and on previous occasions, a diseased or devitalized root is a hotbed for not only pus germs but many germs not pus-producing, and many others which we are not able to show, even by methods of cultivation, at the present time; they are sources of toxic infections that are detrimental in a great many ways. I think we are all indebted to Dr. Grieves for the valuable work he has carried on for a number of years.

Dr. Barrett (closing the discussion). There is nothing further that I can add that would be of interest. I feel that Dr. Smith has covered the subject very well; so I thank you.

Motion was then made and carried to adjourn until the Wednesday morning session.

Wednesday—*Morning Session.*

The meeting was called to order on Wednesday morning, July 1, 1914, at 10 o'clock, by the president, Dr. Seip.

The first order of business was the reading of the report of the Council, by the secretary, Dr. L. M. Weaver.

The next order of business was the reports of committees.

Dr. Schlegel moved that the reports of committees be read by title and published in the proceedings. (Motion carried.)

The secretary, Dr. Weaver, read communications from Dr. H. C. Brown, president of the National Dental Association, and from Dr. E. G. Link, chairman of the Local Committee of Arrangements, inviting the members of the society to the annual meeting of the National Dental Association to be held in Rochester in July.

Dr. Seip appointed as auditors Drs. J. C. Hertz, S. B. Luckie, and Geo. F. DeLong.

The next order of business was the reading of the report of the Committee on the President's Address, by Dr. W. D. DeLong, chairman, as follows:

Report of Committee on President's Address.

Mr. Chairman and Members of the Society, —The Committee on the President's Address approves the recommendation for changing the time of meeting, and hereby offers a resolution that the Council be directed to look into the matter of having the charter of the society so altered or amended as to enable our meeting to be held at some more suitable time of the year, and that steps be taken to obtain this relief at the coming session of the Legislature.

In reference to the recommendation to change the manner of electing officers of the society, with the idea of increasing the efficiency of its management, the committee recognizes the need for great improvement in this respect, but does not believe that the suggestions offered in the address would remedy the defect. The committee believes that the fundamental cause of the trouble lies in the present method of electing Council, and that, if provision were made whereby the component societies were permitted to elect one or more members to Council in proportion to their membership, greater efficiency in management, wider interest in the society, and a more representative form of government would result.

The committee does not believe that any change in the present method of handling the exhibits is desirable.

The recommendation that the duties of a publicity committee be added to those of the committee of local arrangements is approved.

In regard to the matter of dental nurses, the committee believes that the subject is one that will demand the serious attention of the dental profession in the next few years, but the present time does not seem opportune for this society to take any definite action.

We heartily indorse the request of the Lehigh Valley Dental Society that the State Society endeavor to have our public school code so changed that a competent ethical dentist be employed to examine the teeth of school children.

We approve the appointment of a committee to report to the State Society in reference to the distribution to school children of samples of proprietary dentifrices and mouth-washes.

The committee recognizes the overcrowded condition of the dental course, and heartily recommends that the society take definite action looking toward a change of the dental law so as to require a four years' course of not less than eight months each year. The committee further recommends that the existing preliminary educational requirements of four years of high-school work shall be demanded without conditions, before the student has entered upon his dental course.

The president's recommendation that the by-laws be changed to require membership in the National Dental Association is approved.

Of the address as a whole, your committee desires to express its highest appreciation, and commends the various important subjects discussed to the thoughtful consideration of the members of the society.

Respectfully submitted,
F. D. Gardiner,
H. E. Friesell,
W. D. DeLong, *Chairman.*

Motion was made and carried that the report be accepted.

Dr. Weaver moved that the Council be instructed to appoint a special committee to frame amendments to the law consistent with the recommendations of the committee, and that the same be referred to the Legislative Committee, recommending favorable action thereon. (Motion carried.)

Election of Officers.

The next order of business was the election of officers, which resulted as follows:

President—J. G. Lane, Philadelphia.
First Vice-president—H. E. Friesell, Pittsburgh.
Second Vice-president—H. B. McFadden, Philadelphia.
Recording Secretary—L. M. Weaver, Philadelphia.
Corresponding Secretary—G. S. Schlegel, Reading.
Treasurer—W. A. Spencer, Carbondale.
Board of Censors—F. W. Allen, C. M. Bordner, Geo. J. DeLong, E. W. Bohn, A. S. Koser.
Board of Examiners—W. D. DeLong, J. D. Whiteman, C. S. Van Horn, and S. P. Cameron.
Members of Council—W. A. McCready, S. P. Cameron, N. C. Heaton.

Motion was made and carried to adjourn until the afternoon session.

(To be continued.)

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA.

Fifty-first Annual Meeting, held at Delaware Water Gap, May 26-28, 1914.

(Continued from vol. lvi, page 1371.)

WEDNESDAY—*Afternoon Session.*

The meeting was called to order on Wednesday afternoon at 3 o'clock, by the president, Dr. Middaugh.

The first order of business for the afternoon was the election of officers for the ensuing year, which resulted as follows:

President—T. W. Thomas, Wilkes-Barre.
First Vice-president—E. J. Donnegan, Scranton.
Second Vice-president—Walter Richards, Slatington.
Recording Secretary—G. C. Knox, Scranton.
Financial Secretary—G. J. DeLong, Allentown.
Treasurer—C. A. Bachman, Emmaus.

Dr. V. S. JONES moved that the president and secretary be authorized to draw orders on the treasurer for the current expenses of the society prior to the annual meeting. (Motion carried.)

The next order of business was the calling of the roll.

The Board of Censors presented the following applicants for membership: Dr. L. J. Morgan of East Stroudsburg and Dr. R. F. Peters of Allentown. Motion was made and carried that they be elected to membership.

Drs. Hoeffer, Heaton, and Scott were appointed as the Auditing Committee to audit the books of the treasurer.

The first paper on the program for the afternoon session was one by Dr. A. P. HITCHENS, Glenolden, Pa., entitled "Rationale of the Use of Bacterial Vaccines in Pyorrhea Alveolaris." [This paper (see page 1) is published in connection with the proceedings of the Pennsylvania State Dental Society.]

The next paper on the program was one by Dr. JOSEPH HEAD, Philadelphia, entitled "The Practical Use of Vaccines in the Treatment of Mouth Infection."

The two papers were discussed by Dr. W. A. Spencer, Carbondale; Dr. Stevens; Dr. F. E. Stewart, Philadelphia; Dr. E. J. Donnegan, Scranton; Dr. R. H. Riethmüller, Philadelphia; the discussion was closed by Drs. Hitchens and Head.

Dr. SEIP moved that a vote of thanks be extended to Drs. Hitchens and Head for their papers. (Motion carried.)

Dr. SEIP further moved that Drs. Hitchens and Head be made corresponding members of the society. (Motion carried.)

The next order of business was the report of the Committee on the President's Address.

Motion was made and carried that the report of the Committee on the President's Address be adopted.

Dr. STRATTON moved that a committee be appointed to draft an amendment to the by-laws changing the time of the meeting.

The motion was carried, and the President appointed the following committee: Drs. Stratton, Seip, and Knox.

The meeting then adjourned until the evening session.

WEDNESDAY—*Evening Session.*

The meeting was called to order by the president, Dr. Middaugh, at 8.30 o'clock Wednesday evening.

The Committee on the Change in By-laws reported as follows: That Art. XIV of the by-laws be amended to read "The annual meeting of this association shall be held in the month of May or October." This amendment was, on motion, laid on the table for further action at the Thursday morning session.

The next order of business was the reading of a paper by Dr. F. E. STEWART, Philadelphia, entitled "Bacteria of the Mouth, and Their Relation to Systemic Disease."

[This paper is printed in full at page 61 of the present issue of the COSMOS.]

Discussion.

Dr. R. M. STRATTON, Scranton. This paper, like those of this afternoon, seems to me to be beyond discussion, owing to the newness of the experiments which are being made in vaccines, and I doubt if there are many men competent to discuss papers of this description.

For many years I have believed that many deaths and diseases are caused by infection from the oral cavity. I know, from personal experience, of two persons who almost died of infection from pyorrhea; one case was that of a man of high degree, the other of a woman who was a lowly servant. The latter patient died from intestinal trouble while I was treating her. I did the instrumentation necessary in such cases, when she was taken with intestinal trouble and died before an operation could be performed. There was some little difference of opinion as to the cause of her death, but apparently it was appendicitis. In the other case, the man absolutely refused to have his mouth treated in any way, and I am satisfied that he died from infection due to oral conditions.

As I said before, I think very few of us are capable of discussing these three papers from a scientific standpoint, but there is much in them to set us thinking, and I firmly believe the time will come when the condition of the oral cavity will enter into all diagnoses by the medical profession.

Dr. JOSEPH HEAD, Philadelphia. There are one or two points in the essayist's paper which I think it would be well to impress on the audience; these are the value of autogenous vaccines and the way in which autogenous vaccines should be prepared. Dr. Hitchens pointed out that an autogenous vaccine is not, of necessity, one which will cure the disease, but may be one which combines with extraneous germs. Therefore it is very important, in getting a vaccine—First, that the method should be studied by which to get rid of the extraneous germs, and that we get the germs which are causing the disease; second, that we should adopt a method by which the germs may be preserved, and not, as many do, merely make a jab at the point of inflammation, stick that on agar, let it grow for forty-eight hours, and then, without any regard to singling out the various germs, simply count them out and take the number of germs present—which are usually staphylococcus, which will crowd out everything else—and then inject that into the tissue in the wild hope that this "autogenous vaccine" will be the means of a cure. Therefore I feel that the chief thing for the dentist to do is to be careful that the necessary precautions are used in procuring the proper vaccine, and when the specimens are sent to the laboratory, be sure that they are sent to one where proper precautions are taken in the development of the vaccine, and then perhaps we have some chance that the real therapeutic effect of the vaccine will be produced.

Dr. A. P. HITCHENS, Glenolden, Pa. It occurred to me after the meeting this afternoon that I might have been more explicit in answering one of the questions asked, viz, that with regard to the recurrence of pyorrhea after it has apparently been cured. The fact that this disease has been made to disappear by the ordinary local treatment is not any

assurance that it may not appear again, and recurrence is by no means an impeachment that the dentist has not done his work thoroughly. To illustrate this, we may refer to the common furuncle. All physicians have successfully treated patients with boils. With the usual methods, it is not at all uncommon for more boils to develop after successful treatment of those which caused the patient to engage the services of a doctor. The recurrence is believed to be due to the peculiar susceptibility of the patient, and not to any lack of thoroughness on the part of the physician. The recurrence is actually due to the fact that the patient is not immune to staphylococcus infection, and, as patients are ordinarily treated, their recovery from boils is not associated with increased resistance to the staphylococcus. The same may be true of pyorrhea. The disease perhaps is cured as a result of local treatment, but the resistance of the patient to the bacteria causing the disease is not in any way increased, and the patient may have another attack of pyorrhea—about the same tooth or about another tooth. The conditions, I think, are identical. We know of persons who have had a hundred or a hundred and fifty boils in succession. The physician has not been blamed for this, but, if the patient had been treated with staphylococcus vaccine, the recurrence of the boils would have ceased. In my opinion, this recovery from infection without subsequent increased resistance is due to the fact that there is a zone of inflammation about the focus of disease which prevents the immunizing part of the bacterial protein from going out into the tissues, where it may stimulate the production of antibodies. The process is very much more complicated in the case of pyorrhea, because we have usually a number of different bacteria at work, and it is further complicated by the fact that there are nearly always foreign bodies present which are difficult to remove. Then, besides, there is a chance of constant reinfection due to the bacteria of the mouth. If we could cut away all the infected gum tissue and alveolar process and polish the tooth and its root perfectly, then make a surgically clean wound, and apply a dressing that would protect it from saliva and other possible means of contamination —if this could be done, pyorrhea could be easily cured. We can do all this with boils, and yet, unless the patient's resistance to the staphylococcus is increased, they continue to recur. But if the chief part of the treatment consists of the administration of staphylococcus vaccine, the boils disappear, and very rarely recur. Furthermore, I have seen on two or three occasions that boils already developing have cleared up, and have not gone through the usual evolution with pus formation. There is reason to believe that the same is true in regard to pyorrhea. With vaccine treatment, a cure should be more lasting than without it. It is of interest to note that following vaccine treatment, the benefits to the patient are not only local but general. Dr. Head has made really surprising observations in this regard. The benefit to the patient seems to be cumulative in its effect; the patient is not only apparently cured, but there is also established an immunity which causes him to increase in health for a considerable period afterward.

Dr. Stewart (closing the discussion). I do not think that I can add anything more. I have had a delightful visit to your meeting, and I wish to thank the members for the courtesies extended to me, and for the pleasure I have had in addressing you.

Dr. Seip moved that a vote of thanks be extended to Dr. Stewart for his paper, and also that Dr. Stewart be made a corresponding member of the society.

The motion was carried.

Motion was made and carried to adjourn.

THE DENTAL COSMOS

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Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D.

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PHILADELPHIA, JANUARY 1915.

EDITORIAL DEPARTMENT.

THE FORSYTH DENTAL INFIRMARY FOR CHILDREN.

ON Tuesday, November 24, 1914, the magnificent structure erected through the liberality of the brothers Forsyth was formally dedicated to its beneficent use. The occasion of the dedication was a notable one, in view of the fact that it marked the launching of an enterprise for which there is no precedent in the history of public benefactions—or, as expressed in the words of its founder, "In the construction of this building we have entered on a new field; no other building of this character is in existence; the problems we have faced have been encountered for the first time."

An examination of the physical condition of the children of the Boston public schools made under the auspices of the Division of Child Hygiene of the Boston Board of Health during the past year, has shown that of something over 118,000 pupils exam-

ined, more than 51,000 had obviously defective teeth. If to that number were added cases of defective nasal breathing, hypertrophied tonsils, defective palate, and diseased cervical glands, all of which conditions are known to be closely associated with and in a large number of instances caused by defects in development of the dental arches and maxillary bones, it would be found that besides the cases of "obviously defective teeth," over 47,000 additional cases having possible, even probable, causal dental relationships could be properly taken into the account in enumerating the total number of defects remediable either wholly or in part by dental and oral treatment.

The figures presented by the foregoing results of the physical examination of Boston public school children do not materially differ in kind or degree from those which have been obtained, or are normally obtainable, from any similar group of public school children. The need, then, for such an institution as the Forsyth Dental Infirmary is not only an obvious but a crying one. It is a universal need to meet which an attempt is being made in various ways and places—by the establishment of public school dental clinics in the larger centers of civilization, and by the attachment to hospitals and eleemosynary institutions—and, in the case of Philadelphia, under municipal supervision—of clinics for the relief of this general source of physical deficiency among school children. It is, however, to the everlasting credit, benevolence, and farsightedness of the Forsyth brothers that this great institution with its unequaled equipment and installation has been dedicated to the single purpose of redeeming the future citizens of Boston from the physical and mental handicap which the existence of this large class of remediable defects necessarily entails.

But the city of Boston will not be the sole beneficiary of this great humanitarian enterprise. As the pioneer of its class it will forever stand as the material expression of the courage, the sound judgment, the farseeing wisdom and faith of its founder in the largeness and reality of the opportunity which has confronted him for doing good to mankind—an opportunity which he has so intelligently and comprehensively embraced. There can be no question as to the success of the undertaking, for the Forsyth Dental Infirmary for Children is the material expression of a great public need efficiently met, and its mission will not have been completed

when it shall have ministered successfully to the needs of the children of the Boston public schools, nor will its success be finally measured in terms of its local usefulness—for, simply as an example of wise practical philanthropy, it must continue to exert an energizing influence in the same direction, and to arouse the spirit of benevolence in other localities to an appreciation of the untold good to humanity that must follow the creation of similar redemptive institutions in other large centers of civilization. The workers in the large field constituting the oral division of the art of healing may well be congratulated on the striking manner in which the service which the art and science of dentistry may render to humanity has been thus practically recognized; and the work and purposes of the Forsyth Dental Infirmary for Children should receive the sympathetic and cordial support of the profession everywhere.

The dedicatory address by Dr. Donald M. Gallie, which we here reproduce in full, presents in larger scope and detail the bearings both public and professional of this important pioneer movement:

Address of DONALD M. GALLIE, D.D.S., of Chicago,

AT THE DEDICATORY EXERCISES OF THE FORSYTH DENTAL INFIRMARY FOR CHILDREN, BOSTON, HELD NOVEMBER 24, 1914.

Mr. Chairman, Mr. Forsyth, Ladies and Gentlemen,—I wonder if there lives an American man or woman who has not had a great desire to visit Boston? Her colonial history, the part she played in the founding of these United States, the prominence of her sons in war, statecraft, letters, and philanthropy, the pre-eminence of her educational institutions, the architectural beauty of her buildings, the acknowledged culture of her people, and her great interest in humanity's betterment, make this city a shrine that every American should visit. I assure you I deem it the greatest privilege and honor to be the representative of the profession which is to profit so greatly by the ceremonies of today.

This magnificent gift and the dedication of this splendid infirmary mark an epoch in the history of dentistry. That history, unlike that of law, divinity, politics, and medicine, is comparatively recent. It is true that some of the early Egyptian, Greek, and Chinese writers made mention of the care of the teeth, and we have in some of the museums of Europe evidence of early dental operations. It was not until about the first quarter of the eighteenth century that anything worth mentioning was written. About this time Pierre Fauchard, a skilful and learned Frenchman, wrote extensively on the art and science of dentistry. Possessing some social prestige and extensive acquaintance with the learned men of other professions, he obtained for dentistry a recognition heretofore unknown.

To the French we owe much for the development and progress of dentistry; and this is especially true of early American dentistry, for it was Lemaire and Gardette, two Frenchmen, members of the Lafayette army, who started dentistry on a secure foundation in this new land. Boston has always played an important part in dental advancement. It was here that John Baker, one of the first of the English dentists, located, and had as an apprentice Paul Revere of revolutionary fame. It was here that Isaac Greenwood and Josiah Flagg, the two first native American dentists, studied and practiced, and from revolutionary days to the present time Boston has been a generous contributor to our profession.

The names of John Randall, Josiah Foster Flagg, Nathan Cooley Keep, Daniel Harwood, Josiah Tucker, Thos. Henderson Chandler, and Luther D. Shepard graced the roll of honor of American dentists. It was in Boston that Horace Wells, humanity's benefactor, the discoverer of anesthesia, studied and for a time practiced. Here also practiced Dr. William F. G. Morton, the discoverer of the anesthetic effect of ether. Sharing with Boston as a center of dental activity was Baltimore. Here a coterie of brilliant men, led by Horace H. Hayden, and later joined by Chapin A. Harris, did splendid service in gaining for dentistry its proper recognition as one of the professions. Through their zeal and efforts, in 1839 the first dental college was organized, the Baltimore College of Dental Surgery, with Chapin A. Harris as dean. Not satisfied with providing means of educating dentists for the future, these men realized that the education of the men of their time was also necessary—so in 1840 the first dental journal was published, known as the *American Journal of Dental Science*. This was immediately followed by the organizing of the first dental society in the world, the American Society of Dental Surgeons, the outgrowth of which is the National Dental Association, which I have the honor to represent today. Close upon these important events came the first dental law introduced and enforced, in the State of Alabama. It was the first law for the regulation of the practice of dentistry in any country. The starting of a dental college, journal, society, and laws placed America far in advance of other countries in everything that pertained to the knowledge and practice of dentistry; and this leadership I am pleased to say we still retain, although in other countries remarkable progress is evident. Since that time colleges have increased until today we have over fifty in the United States and Canada. The dental journals and the literature of the profession have increased accordingly. Dental societies are to be found in every state, city—yes, and in some sections every county—throughout the country. Every state and territory has laws regulating practice. Every effort is being made to raise the standard of efficiency—higher educational qualifications for college matriculation, extension of the college course, subjects taught that a graduate of a few years ago would hardly recognize as part of a dental curriculum; yet with this wonderful advancement, reaching almost perfection in manipulative skill and craftsmanship, in spite of our improved curriculum, we find ourselves unable to keep pace with the ravages of the most prevalent of all diseases, dental caries and oral sepsis. We know positively that the school children in all highly civilized countries show an alarming percentage of diseased mouths, in some sections as high as 90 per cent. We realized long ago that it was impossible to combat this condition by reparative means; we knew that our only hope was in getting at the cause; but how? Only a small percentage could be reached through the dental office; the influence through the home was limited. We knew the only

way to reach the masses and start our campaign of education was through the channel that all child education and instruction is obtained—namely, the public and parochial school. We urged, first, dental inspection, then class instruction in the care of the teeth, and lectures on oral hygiene. But these suggestions met with strong opposition, not only from the laity, school boards, and municipal officials, but in many cases from the medical profession. It was not until epidemics broke out in schools throughout the country, and the carrier of contagion was traced to the mouth, teeth, and tonsils, that the people and our medical teachers realized the importance of our campaign. In addition, a scientific and practical test was made in the Marion school of Cleveland, which demonstrated conclusively that the mental, moral, and physical condition of school children was greatly improved by dental inspection, instruction, and care.

In 1911, when preparing the annual message for the Illinois State Dental Society, I wrote the president of the school board and the commissioner of health of every city in the United States and Canada, having a population of over 35,000—of which there are about 130—asking them the following questions:

(1) Are the children of the public and parochial schools of your city instructed in the care of the teeth and surrounding tissues?

(2) Are the teeth of these children examined by a dentist?

(3) Have you any free dental clinic in your city where the teeth of the poor are cared for?

I received 65 answers.

To question (1) No, 40. Yes, 25.
" (2) No, 52. Yes, 13.
" (3) No, 42. Yes, 23.

In answer to question 3, the twenty-three answering yes were practically all from cities having dental colleges. Today, but three years later, if we were to send out this inquiry we would find that not only in practically all the large cities, but also in scores of the much smaller cities or towns they have inaugurated dental inspection, class instruction, and in many cases some means of caring for the unfortunate. In many of the large cities provision has been made for from five to fifteen clinics, and appropriations for this purpose run as high as $20,000 a year. Surely this is making progress; yet, gratifying as it is, how inadequate when we consider the tremendous demand and need! Fortunate indeed is the city of Boston, and blessed are the children of this great city, that they have such a citizen and such a benefactor as Mr. Forsyth, who has given this magnificent infirmary.

Not only have the mouth and teeth been the carriers of contagion and disease to children, but also the cause of many diseases the origin of which was until recently unknown. Hunter, the eminent English physician, claims that a diseased mouth is the most prolific cause for much of the chronic infections, diseased glands, intestinal disorders, nephritis, arthritis, pulmonary affections, and heart lesions. Before sixteen hundred physicians and dentists in Chicago a short time since, Dr. Charles Mayo read a paper entitled "The Mouth as a Focus of Infection." He closed in this manner: "The next great step in preventive medicine must be taken by the dental profession. Will they take it?"

In answer to that question, our profession from border to border and from coast to coast is attempting it, but we must creep before we walk.

We have not at present the many advantages that our medical colleagues enjoy. We have no hospital internship, no center of dental thought and instruction in Vienna, Berlin, Paris, London, and Edinburgh, no great post-graduate schools; at the present time no Rockefeller Foundation for Dental Research, no Carnegie Institute, no Johns Hopkins, with their unequaled equipment and unlimited resources. However, we have an army of earnest workers fully conscious of the great responsibilities placed upon them, who are making every effort to equip themselves for the great work, who are forming study-clubs and postgraduate classes in very many of the large cities, where scientific apparatus and laboratory facilities are available. We have state and local societies engaging eminent scientists to carry on special research. We have a National Dental Association which has grown from 900 two years ago to 14,000 today, and which has as component bodies the state and territory society of every state and territory in the Union; and these state and territorial societies have as component bodies all local, district, or county societies within the state, so that today the dentist in the remotest hamlet is in touch with the progress of the profession. We have in the National Dental Association a Scientific Foundation and Research Commission composed of twenty-four of our best thinkers and workers, who are doing excellent work, and who have already made valuable contributions to our science, and who fully expect within the next year to have a fund of $200,000 for research purposes. And today we have another great aid—the Forsyth Dental Infirmary, which I am sure will prove a great stimulus and inspiration to other good men, who, in the near future, will build and endow similar institutions in other great cities of this country.

Today, I feel that our profession is contributing a full measure to the great movement which is going on toward child welfare, race betterment, and human uplift.

Mr. Forsyth,—In behalf of the dental profession and in behalf of our little patients, I offer you our thanks and wish you God's blessing.

Bibliographical.

A Manual of Practical Hygiene for Students, Physicians, and Health Officers. By Charles Harrington, M.D., late Professor of Hygiene in the Medical School of Harvard University. Fifth Edition, Revised and Enlarged by Mark Wyman Richardson, M.D., Secretary of the State Board of Health of Massachusetts. Octavo, 933 pages, with 125 engravings, and 24 plates in colors and monochrome. Cloth, $5.00, net. Philadelphia and New York: Lea & Febiger. 1914.

The reviser, recognizing the growth and importance of the subject, has secured the collaboration of several of his associates in the Massachusetts State Board of Health; thus the book may be taken as an exposition of the views and practices of that body. The work in general has been well done, and in most instances is complete and up to date, though there are a few rather important omissions.

The section on Foods, as in previous editions, is given too much space for a general work, and has been added to by the inclusion of more statistical tables. Reference is made to Dr. Wiley's work on the effects of boric acid and the borates and benzoic acid and benzoates as preservatives, and to his controversy with the Bureau of Chemistry in regard to the latter, but no definite stand is taken on either side.

The section on Water has been somewhat condensed, and it would have been as well if as good judgment had been shown in that on Foods. A few new tests have been included, as those for iron and copper and the use of permanent standards for color determinations. Not sufficient emphasis is laid on the value of storage and sedimentation in water purification, either alone or as a preliminary to filtration, and no mention is made of the use of liquid chlorin in place of hypochlorite, either alone or as an added precaution after filtration, as advised by Major Darnell in 1911 and employed successfully for some months in Philadelphia and elsewhere. The statement that methods of formaldehyd disinfection by spraying have fallen into disuse is rather strange, considering that two of the largest cities in the country, Chicago and Philadelphia, are using spray methods regularly in house disinfection and find that when correctly employed they give decidedly the best results.

Surprisingly little change has been made in the sections on Sewage and Garbage Disposal. Under Disinfectants and Disinfection, reference is made to the U. S. P. H. methods for standardizing disinfectants, but no details are given and no credit is given to Rideal and Walker for their original work in this line. The use of paper sputum-cups for consumptives is emphasized, and a very practical method is given of increasing the efficiency of calcium oxid as a disinfectant for excreta by slaking the lime in hot water in the presence of the excreta, thus combining the chemical

action with the effect of the heat generated. Much emphasis is given to the views of Chapin of Providence and the Massachusetts Board on the uselessness of terminal disinfection after contagious diseases. While there is undoubtedly strong ground for this, many men doubt the advisability of adopting the practice in all cases in private houses, with the present lack of appreciation of sanitation and asepsis by the general housekeeper.

Under Military Hygiene—of especial interest at present—the principal additions are new data and photographs of army tents, and the inclusion of the U. S. A. rules for disinfection and the use of disinfectants.

Under Infection and Immunity, diphtheria immunization is well handled, and reference made to the use of the toxin-antitoxin mixture for this purpose. The advantages of prophylactic typhoid vaccination are dwelt upon, and mention is made of the curative use of the same, but no reference is made to the employment of sensitized vaccines. While their use may still be considered in the experimental stage, it may yet prove to be a decided advance.

Under Quarantine and Administrative Control of Communicable Diseases the new regulations forbidding the use of common drinking-cups in trains, depots, etc., are given, but no reference is made to the common towel or to the control of restaurants or barber shops. The articles on typhoid, tuberculosis, and ophthalmia neonatorum are excellent.

The section on Occupational Hygiene is entirely new and is excellent throughout, with a number of well-chosen photographic illustrations. Special emphasis is placed on the effects of dusts, fumes, and gases and their amelioration.

There is a new section on School Hygiene, excellent as far as it goes, with emphasis on the value of the school nurse and the importance of follow-up work, but not sufficient detail as to the routine examinations by the school physician for the detection of physical defects and their correction. The corrective application of eye-glasses is dwelt upon, as is the value of examinations of the teeth and free dental work by regularly employed school dentists. No reference is made to the care of the teeth in the section on Personal Hygiene.

The section on Insects is much revised, the references to malarial, yellow fever, and filarial transmission by mosquitos being excellent, but the louse as a carrier of typhus fever is not mentioned. References to ticks, bed-bugs, and flies are rather meager, and no reference is made to the breeding-places of the common house-fly—or "typhoid fly" as christened by Dr. Howard—and no mention of methods of destroying flies and preventing their development.

The other sections remain unaltered. The rearrangement and tabulation of the table of contents is a decided improvement.

H. F. S.

A Laboratory Manual of Qualitative Chemical Analysis. By A. R. Bliss, Jr., M.D., Ph.G., Professor of Chemistry and Pharmacy in the Birmingham Medical College. Octavo, 244 pages, with working tables. Cloth, $2.00 net. Philadelphia and London: W. B. Saunders Company. 1914.

A careful examination of this work fails to reveal any large justification for its publication. It is apparently "just another Qualitative Analysis book"

setting forth the same tests that one finds in scores of others. The directions for manipulation are a little fuller than usual, and the lists of alloys and pharmaceutical preparations which follow each group introduce some information which is sometimes desired. The author has changed the recognized group divisions of the elements by calling the acid members of group II "group III," and calling groups III and IV "group IV," but this has also been done by a number of other writers on the same subject. There is nothing in the work apparently to especially commend or to condemn. It is another materialization of the personal point of view which seems to lead each teacher to think that he must have a book of his own compilation.

THE SCIENCE AND PRACTICE OF DENTAL SURGERY. Edited by NORMAN G. BENNETT, M.A., M.B., B.C.(Cantab.), L.D.S.(Eng.), Dental Surgeon to St. George's Hospital and the Royal Dental Hospital, London; Member of the Board of Examiners in Dental Surgery, Royal College of Surgeons of England. With an Appendix on DENTAL JURISPRUDENCE, by P. B. HENDERSON, B.A.(Oxon.), Solicitor to the Supreme Court. With 993 text illustrations; 786 pages. New York: William Wood & Co. 1914.

The title-page of the above handsome volume hardly conveys, to those who have not yet seen it, the intelligence that Mr. Norman Bennett, in addition to his own share in treating certain sections of the book, has essayed the difficult task of editing the work and writings of thirty of his dental colleagues in Great Britain, Canada, and New Zealand; but this knowledge is soon gained by glancing at the pages which immediately precede the first chapter, where it is found that the number of contributors first mentioned is increased by three, two being the names of medical men, the other of a distinguished lawyer.

The publication in one volume of the latest observations of many eminent dental practitioners, each an acknowledged expert in his subject, is a novel event of unusual literary interest and scientific importance in the dental world. It is of interest because this is the first occasion, we believe, in Great Britain, in which several dental authors and authorities have contributed to the making of one volume; it is of importance because, by this contribution the practice of dentistry now takes a closer place with relation to the practice of medicine and surgery, inasmuch as many books, dealing with these subjects, written through the combined effort of an assemblage of experts, have already appeared. This plan of co-operation is not new in this country, but, as has occurred before in similarly constructed treatises, this one, while offering to the reader the most recent scientific methods of treatment of the various subspecialties in the science and art of dental surgery, seems to possess the somewhat serious disadvantages of lack of co-ordination, of a deficiency and incongruity of literary style, of absence of methodical and systematic arrangement, and of a general sense of incompleteness, which are as frequently apparent in our own publications as in the volume before us. It is impossible for an editor to infuse into his army of contributors an identical vein of thought. He can take steps to this end, as is evident here, but the result is not just the same as if the whole were the outcome of his own pen. In short, a collection of essays, no

matter how good they may be individually, is not one with a finished homogeneous literary composition.

Taking the foregoing into consideration, therefore, it may be noted at once that the book is a marked advance on any other British dental work, and as such should be eagerly perused by students and dentists of other nationalities for information with regard to the trend of thought in practical and scientific dental matters in England.

While the choice of subjects has not included our ideas of what constitutes the science and art of dental surgery, the book very creditably achieves its object, which is "to combine the scientific with the practical, for neither is of much value to the practitioner without the other, . . . an effort having been made to include everything in pathology or practice . . . . that might be of value to the modern practitioner."

Of the 786 pages which comprise the volume, nearly two hundred are occupied by contributions with regard to the irregularities in position of the teeth, and the pathological development of their associated parts. The subject is very complete, being dealt with from the points of view of occlusion, growth of the jaws, the influences of heredity, environment, and pathological conditions acting as causative agents, classifications, studies of different types, general objects of treatment, methods of estimation of the size and configuration of the dental arches, comparison between surgical and mechanical treatment, and age best suited for the latter. The principles of retention, mechanics, and physiology of tooth movement, the technique of orthodontics, and the construction of appliances, are fully entered into and described; and this section of the book concludes with descriptions of the correction of individual concrete cases. Throughout these chapters we observe with satisfaction the great influence that American authors and practitioners of oral surgery have had in reducing the study of orthodontics to a scientific proposition, and while not entirely agreeing with the writers, we consider that in these pages the reader has placed before him fair unbiased statements and collections of facts and theories which will be of real service to the average dental surgeon when brought up sometimes against perplexing and difficult situations. It may be that the importance of the mechanics of these problems is a little too much enforced, and we are of the opinion that it is quite easy to lay too great a weight upon the hypothetical mathematical aspect of a condition which, after all, is one of nature's making and therefore hard to reduce to any known precise dogma or formula. The book will, however, probably be chiefly read and remembered for these chapters, and those who have many children in their *clientèle* will be benefited very much by becoming thoroughly conversant with them.

The titles of the other chapters are as follows: Development of the Jaws and Teeth, before and after birth; Affections Associated with the Third Molar and Due to Diseased Teeth; Abnormalities in size, number, form, and structure; Saliva and Calculus; Oral Bacteria; Etiology and Pathology of Dental Caries; Erosion, Abrasion, and Attrition; Oral Hygiene; Treatment of Cavities by Filling; Antiseptic Technique and Dental Surgery; Diagnosis of Cause of Pain; Treatment of Children's Teeth; Diseases of the Periodontal Membrane; Dental Electro-Therapeu-

tics; Injuries and Fractures; Bridge Work; Crown Work; Extraction of Teeth; Local Anesthesia; Oral Sepsis; Empyema of the Maxillary Sinus (exclusively from the rhinological and not as it should be, from the dental aspect); Dental Radiography; Odontomes; Actinomycosis, and Dental Jurisprudence.

Of these, strictly speaking, it seems to us that the articles describing the "Development of the Jaws Before Birth," "The Dental Operating Room: Its Appointments and Hygiene," "Odontomes," "Actinomycosis," and "Oral Sepsis," are unnecessary, if not out of place, in a volume of this kind. While the last-named essay is very readable, it must be remembered that the whole subject of so-called oral sepsis—or "dental" sepsis, as we note some would prefer to call it—so little understood, is nevertheless inclined to be over-elaborated, not to say even embroidered, with the result that many dogmatic and doctrinal *ex parte* statements connected with it must be greatly discounted, and time must be allowed to show the valency or otherwise of somewhat prejudiced views.

With regard to further changes in nomenclature, we cannot think that, as shown on page vi of the preface, the substitution of "inferior alveolar canal" for "inferior dental canal," "inferior alveolar nerve" for "inferior dental nerve," and "auditory tube" for "Eustachian tube," is anatomically correct or desirable. The terms "mandibular canal" and "mandibular nerve" are surely to be preferred.

A useful feature of each chapter—with the exception of five—is the addition of a complete list of references to papers and text-books dealing with each subject, and a particularly complete index concludes the volume.

The work has been well published. It is singularly free from typographical or other errors, but each page should bear on the top some indication of the character of the text beneath. With a rearrangement of the parts, the omission of some, the fusion of others—as, for instance, chapters XVIII and XLVI—the "heading" of individual pages, and the replacement of a few illustrations which are old-fashioned and should be either redrawn or excluded, the second edition should enjoy even a larger circulation than will evidently be the case with the first. We can thoroughly recommend the book.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Journal of the American Medical Association*, Chicago, November 14, 1914.]

THE TONSILS AS A HABITAT OF ORAL ENDAMŒBÆ. POSSIBILITY OF SYSTEMIC COMPLICATIONS OF ORAL ENDAMŒBIASIS. By Allen J. Smith, M.D., W. S. Middleton, M.D., and M. T. Barrett, D.D.S.

[*American Journal of Clinical Medicine*, Chicago, November 1914.]

HAS PYORRHEA BEEN MASTERED AT LAST? Editorial.

In continuation of their important and most promising studies on the endamœbæ, Smith and Barrett* have now been able to prove that these parasites at times involve the tonsils also. Believing that from their proximity to pyorrhea pockets, which these investigators hold to be the analogs of the ulcerous excavations found in the mucosa and submucosa of the colon in amœbic dysentery, and from their favoring anatomic structure, the tonsils might be invaded and form another habitat for these endamœbæ, they have made a number of examinations of tonsils to determine their occurrence in these organs. Of seventeen cases of excised tonsils, five showed the motile amœbæ of the type of endamœba buccalis Prowazek. The tonsils of the five persons in whom these organisms were demonstrated were all large, with pouting crypts, and were removed from young persons presenting the usual local and general symptoms of chronic tonsillitis with irregularly occurring exacerbations. A fully satisfactory method for collecting the cryptal contents of tonsils *in situ* still remains to be worked out.

Pyorrhea alveolaris has for years been suspected of primary relationship to various systemic disturbances, including particularly certain chronic or recurrent arthritic affections, and possibly, too, some of the anemias of obscure origin and degenerative lesions of various parenchymatous organs; and even greater suspicion, amounting almost to certainty, has attached to tonsillar affections in relation to such systemic complications. Thus of six cases of chronic arthritis, four exhibited endamœbæ in material obtained from the tonsils. In several instances of cases treated for pyorrhea by Dr. Barrett, the disappearance of symptoms of gastric and intestinal disorders simultaneously with the cure of the pyorrhea was noted.

In another case of pyorrhea and associated obscure anemia, the local administration of emetin hydrochlorid for the pyorrhea was promptly followed by a remarkable gain in weight and improvement in general condition, which suggests the possibility that some of the obscure anemias, especially those suspected of being of hemolytic origin, might find their explanation in oral endamœbiasis. In the gums of three other cases regarded as pernicious anemia endamœba buccalis was found, and in one of these also in the tonsils. Though no definite conclusions could be made, as other remedies were applied conjointly, emetin applied locally and hypodermatically produced notable improvement.

The writers freely acknowledge that the scant data here presented can in no wise be interpreted as proving that oral endamœbiasis is surely a factor of generalized intoxication in the production of arthritis and anemia. The positive finding of the parasitism, however, and the favorable results of emetin therapy in the few cases reported, are sufficiently suggestive to warrant further trial. Whatever the relations may be between the amœbæ and the accompanying vegetable micro-organisms, one may be certain that the amœbæ feed largely on the latter, and in this bacterial phagocytic action they doubtless set free from this and that organism different

* Dental Cosmos for August 1914, vol. lvi, p. 948; also December 1914, vol. lvi, p. 1345.

endotoxins, and the end-results of toxic absorption are sure to vary, now manifesting as hemolysis, now as cellular degenerations or necroses of fixed tissues, now as inflammatory changes, as of synovial and serous membranes.

The *American Journal of Clinical Medicine*, commenting on Barrett and Smith's discovery, hails it as promising to be the most important therapeutic discovery since Ehrlich put out salvarsan, and reprints in full the editorial comment of the *New Orleans Medical and Surgical Journal* of October 1914 on the findings of amœbæ in pyorrhea alveolaris by Dr. C. C. Bass and F. M. Johns, of the Tulane College of Medicine, presented in a paper read before the Orleans Medical Society meeting held on September 14, 1914. These investigators, who have been prominent in the study of malarial organisms, demonstrated the endamœba buccalis in the mouth lesions of 85 out of 87 cases, and in all stages of pyorrhea. They further announced having obtained most remarkable and gratifying results from treatment with emetin hydrochlorid, administered hypodermatically. They have experimented considerably, with the object of determining the proper dosage of emetin for this purpose, also to ascertain the proper interval between doses and the necessary duration of the treatment. They have not reached final conclusions, and are emphatic in stating that further experience and experiments now under way are likely to modify the present routine.

The dosage suggested is ½ grain of emetin hydrochlorid dissolved in one cc. of water, given hypodermatically in the arm—or other part of the body—each day for three successive days. A similar dose should follow every fourth to seventh day, until the gums are entirely healed and the loosened teeth have been tightened in their places. The degree of peridental membrane destruction will determine the length of treatment, which may be only a few days or may need months.

The object of the repeated doses of emetin after the first few days' treatment is to destroy any amœbæ which may have escaped the previous treatment, and to prevent the reinfection likely to occur before the gums have had a chance to heal and the root sockets to resume normal condition.

Infection with this particular amœba is widespread, and the authors suggest that brushing the teeth with a few drops of fluid extract of ipecac on a wet brush may be prophylactic in mild or early cases of the disease. Bass and Johns express the belief that the treatment submitted by them is specific for pyorrhea alveolaris, but that it cannot be expected to replace the physical damage done by the disease. The usual dental care of the mouth must be practiced, and the treatment of gums and mouth is necessary just as if there were no such infection.

The *American Journal of Clinical Medicine* considers Barrett and Smith's treatment of filling the gingival pockets and their walls with a 1 per cent. solution of emetin hydrochlorid as more logical, and suggests that the ideal method of treatment would apparently be the conjoint use of hypodermatic injections and local applications.

[*Zahnaerztliche Rundschau*, Berlin, November 8, 1914.]

STATISTICAL OBSERVATIONS ON DIABETES AND PYORRHEA ALVEOLARIS.

By Dr. Juljan Zilz.

The writer's extremely valuable statistics have been collected during the months of May and June 1914 in the First Medical Clinic of Vienna, in one hundred diabetics belonging mostly to the working class, who had enjoyed dental treatment in but few instances. Seventy-one of these one hundred diabetics were suffering with pyorrhea alveolaris, the women being more generally affected than the men. In regard to the synchronism of diabetes and pyorrhea, it was ascertained that in 47.8 per cent. the pyorrhea had preceded the diabetes, which fact speaks strongly in favor of those observers who maintain that every pyorrhea patient is a suspect of diabetes. In 9.8 per cent. the pyorrhea immediately followed the incipiency of the diabetes. In 25.3 per cent. the pyorrhea alveolaris appeared simultaneously with the diabetes.

The fact that in 28 per cent. of cases the appearance of diabetes and pyorrhea was associated with circular caries [erosions?] at the cervical margins of the anterior teeth and bicuspids as well as at the buccal surface of the molars, corroborates Scheff's view that caries appears relatively soon after diabetic affection, and in some cases may be utilized

as a diagnostic symptom. It is not surprising to find dental caries in diabetics, since in diabetes there are disturbances of the pancreatic secretions, diabetes being artificially produced in animals by extirpation of the pancreas. This pancreatitis arises in diabetics no matter whether it be due to syphilis, arterio-sclerosis, former infectious disease, trauma, over-exertion, etc. According to Kranz, pyorrhea alveolaris is a very good aid in the early diagnosis of disturbed carbohydrate metabolism, which is regulated by the pancreas, the suprarenal capsule, and the hypophysis cerebri.

Of twenty-nine diabetics examined who exhibited no pyorrhea, sixteen had suffered with diabetes only a few weeks; yet even in these, subjective discomfort as well as slight redness of the gingival papillæ and viscous deposits upon the cervical margins labially and lingually of the incisors and molars were noted. In three edentulous patients who wore full dentures, soreness of the gums and ulcerations had occurred simultaneously with the beginning of the diabetes, and the wearing of the dentures had become impossible. In five patients of sixteen years and less, no pyorrhea could be observed.

In two other carefully compiled tables, Zilz gives the appalling number of 522 teeth which had fallen out in his one hundred patients, and the ratio of frequency of loss for each class of teeth, as follows: Lower centrals and laterals, upper centrals, laterals and second bicuspids, lower canines and second bicuspids, upper canines, lower first molars, upper first molars, lower first bicuspids, lower second and third molars, upper first bicuspids, second and third molars. The ages of the patients in whom this ratio was obtained ranged between thirty-five and seventy years of age, and the ratio of loss between lower centrals and upper third molars ranged between 84 and 4 per cent. The saliva in all these patients showed acid reaction, and there was increased sensitivity of the teeth to thermal changes and fruit acids. In almost all cases, subgingival calculus, gingival inflammations and pockets, necrosis and resorption of the alveolar process and pus on the labial cervices of lower incisors and upper molars were observed. Microscopic examination of pus smears always showed a mixed infection. In several cases the loose teeth became firm again upon the institution of therapeutic treatment of the diabetes.

[*Oesterreich.-ungarische Vierteljahrsschrift für Zahnheilkunde*, Vienna, April 1914.]

IMPLANTATION OF ARTIFICIAL ROOTS BY THE GREENFIELD METHOD. By Dr. J. Peter.

Peter gives a very interesting history of the efforts at replacing lost teeth by replantation, transplantation, and implantation, the first authentic case of which is reported by Ambroise Paré in 1594. He criticizes the incomplete description of technique and the fragmentary case histories which Greenfield gives in his article published in the April 1913 issue of the Dental Cosmos, and also the lack of explanation of the healing process which follows the implantation of artificial roots. Peter's technique differs from that of Greenfield in that he does not always leave a central core of bone, the nutrition of which he considers so seriously impaired, for some time at least, that the danger of its becoming infected is very great. Instead of cylindrical trephines like Greenfield's he uses conical ones with larger diameter at the cutting edge. Instead of filling the root-socket with bismuth paste—which he considers impossible—he dips his cribs into liquefied bismuth paste. These cribs, which are also slightly conical, corresponding to the shape of the trephine, are made of 20 per cent. iridioplatinum with a 20-karat gold base, and have a diameter of 5, 7, and 9 mm., the 11-mm. size being too large for European jaws. Owing to the conical shape of the crib, no fixation or other protection is necessary. Peter, following Schroeder's opinion, believes that the crib is surrounded by a more or less thick layer of connective tissue, resembling periosteum, and that new bone will form only in very favorable cases. The chances of an artificial root healing-in are the better the sooner after the loss of a tooth the operation is made. The character of the alveolar process must be closely examined. In arteriosclerosis, implantation is contra-indicated. Great caution is necessary in manipulating the trephine, as the jaw-bone varies in thickness, hence also in resistance. Peter's arguments are supported by several text figures, illustrating the technique, and thirty beautiful radiographs showing various stages of the

healing process in the five cases of implantation reported, one of which proved a failure owing to infection supervening.

[*Philosophical Transactions of the Royal Society of London*, Ser. B, vol. ccv.]

ON THE PROCESS OF CALCIFICATION IN ENAMEL AND DENTIN. By J. Howard Mummery, L.D.S., M.R.C.S.

Mummery's name is so intimately connected with research in dental histology that we have come to regard any of his writings on this subject as of highest authority. In the present essay he endeavors to show that calcification in dentin and enamel is in great part a physical phenomenon, and that the actual deposit occurs in the form of calcospherites. While it is true that no artificial experiment can accurately represent what occurs in the living body, the resemblances are very strong, and the objections have been chiefly based on the chemical difficulty of the composition of the dentin and enamel. He has, however, endeavored to show that the spherical form is not retained in completed, well-formed dentin or enamel, and it is highly probable that when the lime salts are deposited in the colloid matrix substance, they are true calcospherites as produced artificially, the carbonate of calcium being combined with a small proportion only of phosphate. As phosphates are added from the blood, the large calcospherites break down, and the disintegrated particles form the finally consolidated enamel.

In dentin, also, except where the process has been arrested at the interglobular spaces, a similar breaking down takes place, the only evidence of their former presence being the lamination of the dentin, finally obscured by full calcification.

The protoplasmic prolongation of the cell in the form of the dentinal fibril would be considered to share in the functions of the cell of which it forms a part, and there are strong evidences that calcific matter is transmitted by the fibril. The translucent zone in caries, which a great weight of evidence suggests is due to calcification in the tubes, and the peripheral occlusion of the tubes on exposed surfaces, point to this extension of the cell protoplasm being the channel by which lime salts are conveyed to the dentin.

If, as is claimed, the sheath of Neumann serves as a dialyzing membrane, the comprehension of calcification in the dentin is simplified. The odontoblast cell, either alone or in common with other cells in the pulp, would deposit the gelatinous basis substance of the odontogenetic zone, the lime salts from the circulating blood would be transmitted by the fibril, and, by dialysis into the matrix, lay down the calcifying material in globular form, slow diffusion of the component salts being an important factor. Globular calcospherites in the enamel also suggest this slow diffusion, by dialysis through the inner ameloblastic membrane, or its equivalent—the outer surface of the albuminoid material in which the deposit takes place—and, as the matrix substance becomes richer in phosphates, the breaking-up of these bodies into smaller elements.

[*Universal Medical Record*, London, May 1914.]

DENTAL CARIES IN CHILDHOOD. CRITICAL ANNOTATIONS.

The *Record's* critical review of several important papers on dental caries in childhood is not only a welcome symptom of the recognition of the importance of this problem in medical circles, but it contains so many points valuable to the dentist who, with the increasing enlightenment of the public in dental matters, is so often called upon for advice in regard to dietetics, that it deserves special consideration in these columns.

If we indeed dig our graves with our teeth it would appear that there are those who hasten the work not by energy but by neglect of the instruments. Dental caries is favored by too easy a treatment of the teeth, and the fault takes divers forms, some of which are discussed by Fordyce and Gibbs (*Edin. Med. Journ.*, March 1914). These observers believe that the common causes of dental caries and dyspepsia in childhood are: (1) lack of breast-nursing, improper hand-feeding; (2) pap-feeding on weaning; (3) misuse of raw fruit, habitual sweet-eating; (4) excess of carbohydrate food; (5) lack of animal food.

Three months of breast-feeding is generally held to be very advisable, but the welfare of the teeth requires a longer period. The child fed naturally for a longer time has larger arches than the hand-fed one, because of the effort of suckling and the spreading effect of the nipple which is pressed on the palate by the tongue. Hand-feeding favors maldevelopment of the teeth, which are subsequently

removed because of their unsightly appearance.

Toward the end of the first year too great distrust of the baby's digestive power is very common, and concentrated soft pap, generally over-rich in carbohydrate, is freely administered. Now, the teeth suitable for chewing appear in the second year; the incisors, which are meant for tearing and gnawing, are the first to show. The gnawing of bones under supervision is beneficial, and the child should also have fresh fruit juice by being allowed to suck the juice from an orange. Raw fruit may be given to chew and suck only if great care is exercised.

In the second year, milk is still the chief part of the diet, but animal food is required —eggs, soup, fish, and light meat—and a variety of vegetable food is advisable. The desire to use the teeth is destroyed by giving food which does not require mastication. Therefore starchy food should be given in as dry, coarse, and hard a form as possible. Abstinence from meat in the second year favors flabbiness and a tendency to adenoids and tonsillar, pharyngeal, and glandular tuberculosis. The potato, of which we hear so much in these days, is often less valuable than well-boiled vegetables, and stewed fruit is generally safe.

No meal should end with biscuit, jam, or cake. The fragments lodge and ferment. They ought to be scrubbed off with hard toast and butter, or rusk, and if possible followed by fresh fruit. Apple juice is acid, and has a good scouring effect. A good substitute is a saturated solution of acid potassium tartrate, with which the mouth may be rinsed.

It is interesting to note that, however useful acid be in the mouth when the teeth are sound, in the presence of caries it causes pain. Hence a useful symptomatic treatment of toothache is to use a solution of bicarbonate of soda or sal volatile, which neutralizes the acidity and checks the pain. We must note, however, that many dentists hold that acid products from carbohydrates favor caries by attacking the enamel.

The indiscriminate eating of sweets is a great evil. The value of a tooth-brush used at bedtime is very small. After each meal the mouth ought to be left in a naturally hygienic state. The dyspepsia in childhood is usually of carbohydrate origin, and bread, biscuits, porridge, potatoes, and puddings have their dangers from excess. The gastroenterology of childhood should concern itself with prescribing *apéritifs* less than with a sufficiency of proteins.

The quinquennium starting with the age of eight is a unique period of health, activity, endurance, and extension of interests outside of adult influence. Breakfast should be the first meal, and there should be three others between it and supper at 6.30 P.M. Dental caries is very common, and an affected tooth should be filled without delay so that it may be used. A tooth which cannot bite because it is tender favors irregularity of the permanent teeth.

At this age, too, the child has orgies of "tuck" at any odd time. Sweets ought to be eaten in small quantities at dinner and tea and followed by raw fruit. Sugar always occurs in nature (except with honey) mixed with a large proportion of detergent fibrous tissue and acid salts; thus mixed it is harmless.

Another investigation into the causation of dental caries in childhood has lately been reported by Cook (*Lancet*, March 28, 1914). His study deals with the effects of drinking-water in eighty districts on the teeth of children over twelve years old. His article represents a vast amount of labor of a severely statistical kind, but it may be said that he aimed at correlating the total, the temporary and the permanent hardness of the drinking-water with the percentage of children having four or more carious teeth—this standard coinciding with the returns required by the medical officer to the Board of Education. He finds a definite association between the quality of the drinking-water and the amount of dental caries amongst the school children: the harder the water the better the teeth, and obversely. The correlation is highest (0.491) in the case of the temporary hardness, and this is of interest in view of the recently advanced conjecture concerning calcium metabolism and dental caries.

Cook has also found that districts with harder water have a lower infantile mortality, also that where the infantile mortality is low the children are found to have better teeth. There is no evidence to show that unfavorable surroundings, such as are found in the industrial districts of Yorkshire and Lancashire, have any influence upon the relationship between the hardness of water and the amount of caries amongst school children.

There is thus an association between excessive softness of water and an increased amount of dental caries amongst the school children (so far as urban districts are concerned) and obversely. Environmental conditions do not seem to be a source of the relation, which Cook points out specifically as merely an association and must not be regarded as necessarily cause and effect.

One may adduce, in support of Cook's study, the appalling prevalence of vile teeth among the natives in Wales, and the possibility of an increase in the amount of dental caries in Birmingham, which has a soft water, drawn from the Welsh mountains.

It was stated above that lack of breast-feeding was a fruitful cause of dental caries in childhood. It may be necessary, however, to wean a child in conditions such as those suggested a year ago (*Univ. Med. Record*, 1913, i, p. 212). Similar and other considerations on weaning are discussed by Leuret (*Journ. de Méd. de Bordeaux*, April 5, 1914). He is in favor of partly weaning an infant after the fourth month, even though it is progressing well on breast milk and the mother's health is good; giving just one bottleful of cow's milk a day. thus providing for the case of a severe illness or death suddenly interrupting lactation. He advises 100 c.cm. of pure milk, three hours before the next breast feed is given, and this should gradually lead toward four-bottle feeds in the eighth month.

He also points out that approximately 11 per cent. only of women desire to suckle their babies, quoting Buller of Madrid, though Marfan and Aschoff (in 1911) found about 9.3 per cent. of women were incapable of doing so. Much the same figure has recently been given in this country for women of the higher classes, who have a sincere wish to complete their natural function.

We shall not follow Leuret in his enumeration of the well-known local and constitutional states which necessitate weaning. His remarks on the better-known of these contain nothing novel, while the others he cites require much further evidence before their relationship with weaning can be accepted. His remarks on alcoholism in the mother would be well ignored in favor of those by Ortali (*Gazz. degli Osped.*, November 30, 1913), who dwelt at length on the results, in children, of drunkenness in parents, though his conclusions also erred on the sweeping side.

Leuret points out that the quantity of iron in the infant is important with regard to weaning. The iron in the suckling is more than that in the ash of the milk. Increase in weight depends on the amount of iron fixed in liver and spleen, and therefore when an infant has to be weaned early, iron should be given. According to Barber, spinach soup (containing 36 mgm. to 100 gm.) has no result. Meat-juice, containing 20 to 37 mgm., may be given up to six drams a day; egg yolk, which contains 15 to 24 mgm., also contains fats which disturb digestion; barley contains 21 mgm.

Leuret concludes that the normal child should be weaned gradually from the ninth month; the syphilitic or tuberculous, or born of debilitated parents, about the fifth month.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

SECTION V.—*Dental Prosthesis.*

PORCELAIN WORK. By DOUGLAS GABELL, M.R.C.S., L.R.C.P., L.D.S.ENG.

Porcelain powder cannot be packed to more than two-thirds fill any space. This is the only cause of shrinkage. There are other causes for distortion and fracture during fusing.

Maximum consolidation takes place at a temperature far below the advertised fusing-points, and before glazing of the surface.

Time is as important as temperature in fusing.

The amount of shrinkage cannot be reduced, but the effects can be controlled.

Porcelains vary very little in strength and shrinkage, but very much in fusing-points, working qualities, appearance, weight, and solubility.

Platinum gauze and wire, correctly placed, can greatly strengthen and assist in the manipulation of porcelain.

Price's "artificial stone" is of great value in manipulating porcelain.

Porcelain body should be fused inclosed in an investment and not openly exposed in the furnace.

Section VI.—*Orthodontics.*

A MODIFIED JACKSON CRIB. By Hubert C. Visick.

The Jackson crib is an excellent means for retaining removable orthodontic appliances, but where one has to crib a permanent tooth which is only partly erupted, it is sometimes impossible to get a secure hold.

In these cases one can obtain all the necessary hold by soldering a piece of metal plate to the gingival aspect of the crib, and shaping the plate to grip the neck of the tooth, particularly at the medial and distal angles.

Another piece of plate fitted to the neck, on the lingual side, still further increases the grip.

A NEW SYSTEM FOR THE CORRECTION OF PROGNATHISM AND ANTEVERSION OF THE TEETH WITHOUT HEAD-GEAR OR ANY OTHER EXTERIOR APPARATUS. By Dr. Vincenzo Guebini, Naples.

The difficulty of persuading patients, especially young ladies, to carry external orthodontic apparatus, and the accidental displacement of the same during the night, have brought me to invent a more rational, easy, and sure method for the correction of prognathism and anteversion. This method has also the advantage of avoiding the unpleasant and often injurious application of gold bands to the molars.

The apparatus consists of three pieces, two lateral and one anterior. Each lateral piece is formed by a long cap of fused gold applied to the molar and premolar teeth, and upon which a retention point is to be found near the first premolar. The front piece consists of a gold plate covering the incisors and canines and to which two buttons are soldered, one at each lateral end. On each side a ring of elastic rubber clasps the button and the above-mentioned retention point, so that, by means of the traction of these two elastic rings, the plate is continually pressed on the anterior surface of the front teeth.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

THE VELUM OBTURATOR FOR THE MECHANICAL CORRECTION OF CLEFT PALATE. By Calvin S. Case, D.D.S., M.D., Chicago.

The principal claims of this paper which are new and as yet unpublished relate to the possibility and importance of retaining the velum obturator in its position in the mouth principally through the involuntary activities of the palatal and pharyngeal muscles, without the employment of any dental plate or other contrivance to which artificial palates are usually attached. And while it rests lightly and comparatively loosely in its place, giving free access of air through the nasal passage for healthful breathing, but with power on the part of the muscles to effectively close this opening in the utterance of nearly all the sounds of speech, and while patients are enabled to easily remove it at will for cleansing purposes, it is secured from the dangers of accidental dislodgment in any position of the head during either waking or sleeping hours, and consequently is worn with perfect unconsciousness of its presence in the mouth. It is shown, moreover, that the importance of this qualification lies not so much in the matter of convenience to patients, as in that it enables them to attain to those higher qualities of speech—especially resonance—which are found to be so invariably absent with all who wear artificial palates.

A NEW TREATMENT OF MAXILLARY SINUSITIS. By Dr. B. Landete, Madrid.

The well-known inflammation of the maxillary sinus has been treated by several processes, according to its character—empyema, pyo-sinus, simple sinusitis (pyo-sinusitis), or fungous sinusitis, caused by hypertrophy of the mucous membrane which covers the sinus.

More than a year ago (May 1913) we first operated on a patient by our new extra-simplified proceeding. The case was that of a physician, who had suffered for fourteen months from nasal suppuration consequent to periodontitis of the upper right first molar, the alveolus of which exhibited a fistula. We employed the first time the Caldwell-Luc radical operation, through the canine fossa, under local anesthesia; careful scraping of

the sinus was performed; we then proceeded to fill it with iodoform paste, and immediately sutured the mucous membrane.

The patient became completely cured, so that it was not necessary to operate further; the cure was therefore by first intention. We, so far, have treated about one dozen cases and employed different iodic mixtures or pastes —iodol, iodo-anisol, iodocresol, azodolene, pellidol, etc., all of them having been followed by marked success.

In presence of such results, we venture to recommend this procedure.

SECTION VIII.—*Anesthesia (General and Local).*

ANESTHETICS AND DENTISTS, AND THE VERY EARLIEST CASES OF ETHER ADMINISTRATION IN ENGLAND. By Dr. W. A. Hunt, Yeovil.

1. The important part the dentist has played in the discovery and development of anesthesia, whether general or local.

2. This is exemplified in the history of nitrous oxid for general anesthesia, and in the installation and also the hypodermic injection of cocain and its congeners for local anesthesia;

3. But more particularly in the dawn of the use of ether in America by Dentist Morton, and its first use in England by Dentist Robinson, as given in his personal notes, and his descriptions of his apparatus and methods of administration, and of its use in ten large London hospitals, and in numberless private cases by him for the most severe operations; and references to twenty-five large provincial hospitals, as well as at St. Louis Hospital, Paris, by Malgagne and Velpeau, etc.; and all this before the year 1847 had passed.

The notes came to the writer from his father, who was a personal and intimate friend of Robinson.

4. The strange opinion of some in this country, who *now* think the dentist should not be allowed to administer any anesthetic, even though he hold a legal dental diploma!

5. Reference to the excellent Wellcombe Historical Medical Museum, where are oil-paintings and drawings, etc., of the very first cases of anesthesia—an admirable collection of very varied apparatus for and connected with anesthesia by inhalation, with an exact model of the very thing used for Liston during the first amputation of a thigh under ether, 1846, anesthetics of the ancients, etc., altogether an admirable collection—curator, Mr. Thomson.

SECTION IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

PRACTICAL RESULTS OF SCHOOL DENTAL TREATMENT IN THE PROMOTION OF NATIONAL HEALTH. By Professor Dr. E. Jessen, Strassburg.

Public mouth hygiene is of international concern. Nevertheless its importance has only been recognized within recent decades, but it has now been introduced into all civilized countries. The basis upon which mouth hygiene must be built is dental treatment in schools, and consequently this is the object in view at present in all countries.

From 1892 the town of Strassburg contributed an annual grant of about Mk. 1200 for the dental inspection of school children, and thus recognized the necessity of their dental treatment, and thereupon opened the first municipal school dental clinic on October 15, 1902. The work was begun with limited accommodation, a modest equipment, and only one assistant. Their yearly accounts amounted to Mk. 2400, and increased steadily to Mk. 11,400 in 1910. In the year 1911, when established in the splendid hygienic institution fitted out with model equipments, and specially built for the school dental clinic, the staff consisted of nine persons, and the annual cost amounted to Mk. 26,500.

From the time of the opening of the school dental clinic 30,000 children were inspected, 70,000 treated, and in round numbers there were 75,000 fillings and 75,000 extractions in eleven years. Altogether the town of Strassburg had spent Mk. 152,000 on school dental treatment since 1892.

Soon other German towns followed the example set by Strassburg. In less than ten years 213 school dental clinics had been established, having an aggregate yearly expenditure of Mk. 560,000. Nearly two million national school children were entitled to be treated in these clinics, and altogether about 227,000 children received treatment in 1913.

It must be the task of school dental treatment to reduce the percentage of decayed teeth in the shortest possible time, and to

increase that of the sound teeth in order to bring nearer the realization of our ideal of a completely healthy mouth in every child attending school.

SECTION X.—*Dental Education.*

DENTAL POSTGRADUATE EDUCATION IN GERMANY. By PROF. DR. W. DIECK, BERLIN.

Dental surgery has developed so rapidly that the need for further education in new methods of practice was felt in Germany so strongly that a Committee for Postgraduate Dental Education was formed as far back as 1902.

The means employed for this purpose are—

1. Separate courses with demonstrations, in which the participants do practical work as far as possible.

2. Courses of one week's duration held in large towns, preferably a university town.

3. Single lectures on important subjects in scientific and practical dentistry or in other medical subjects related to dentistry.

Postgraduate education in Germany is decentralized; there have been formed in most of the provinces local committees which arrange courses and demonstrating lectures independently, the central committee lending support by supplying expert teachers or in other ways.

The "collection of objects for dental instruction" now kept in the dental college of Berlin University, is an additional means of instruction. The objects of this collection are sent free of cost anywhere when required for lectures or demonstrations.

The most recent effort to extend dental postgraduate education is the attempt to organize an international exchange of prominent men in the profession. Preliminary negotiations toward this end are being conducted between Germany and the United States of America.

PERISCOPE.

Calcium Chlorid in Hemophilia.—Patients suffering from hemophilia should be given calcium chlorid mixed with a little chloroform water, in 5-grain doses three times a day for a few days before extraction. —C. CHARLTON, *Commonwealth Dental Review.*

Keeping Gutta-percha Points Sterile.—Three clear glass dental medicine bottles are filled with alcohol, and the different sized points are placed in them. In this way, sterile points of the various sizes may always be had ready for immediate use.—F. E. CLINITE, *Dental Digest.*

Effect of Drinking-water Upon the Prevalence of Caries in School Children.—The harder the drinking-water, the better the teeth and the lesser the infant mortality; again, the lesser the infant mortality the better the teeth. Districts with soft water are preferred by industrial concerns; the poor hygienic conditions prevalent in manufacturing districts enhance the detrimental effect of the soft water.—COOK, *Lancet.*

Foot or Elbow Taps for the Wash-basin in the Dental Office Essential to Aseptic Practice.—When practicable, it is very desirable for the water supply to the wash-basin in a dental office to be fitted with the hospital foot or elbow tap. This obviates the necessity of touching the tap with soiled fingers, and prevents the possibility of passing infection or dirt from one patient to another.—B. CORBETT, *Commonwealth Dental Review.*

Nitrous Oxid Analgesia in "Insusceptibles."—Some persons can take almost pure nitrous oxid without losing consciousness, but it is not always necessary with these insusceptibles to give a particularly strong mixture for anesthetic purposes. We may find a very few patients who, do what we will short of rendering them unconscious, still say that they feel pain; but they will usually admit that it is but slight, and they are too contented to mind it, in which case it will be better not to push the anesthetic farther, as the after-effects, usually insignificant, will be more pronounced.—*British Dental Journal.*

Sterilization of Anesthetic Inhalers.—Particular caution should be exercised in the care of inhalers and breathing tube, that they are not a means of communicating infection from one patient to another. A few minutes' bath of the inhalers and tubing in a 1:5000 or 1:10,000 cyanid of mercury solution, followed by rinsing in water, and the use of the tubing with the inside wet, will prevent this contamination, and will insure a dust- and germ-free gas for the patient.—E. I. McKesson, *Ash's Monthly.*

Calcium Lactate as a Safeguard Against Hemorrhage.—It is not uncommon that cases present for extractions who give a previous history of severe and long-continued hemorrhage. One of the simplest and safest drugs for controlling this idiosyncrasy is calcium lactate. A dose of 5 grains three times a day, for several days before the operation, generally insures an absence of trouble in this direction. The drug can be obtained in tabloid form, and can be continued subsequent to the operation, if any doubt still exists as to the possibility of secondary hemorrhage.—E. S. Fischer, *Australian Journ. of Dentistry.*

Diagnosis of Necrosed Pulp.—Necrosis of the pulp is frequently met with. A pulp may be dead for months without causing any disturbance; it may be discovered on examining the teeth of a patient without the latter having any knowledge of its existence. The tooth under observation is often more or less discolored, heat or cold produces little or no reaction, and the translucence has usually become dulled. But the safest diagnostic aid is the electric current—a necrotic pulp does not respond to even the full current of the ordinary battery. The pathological types of pulp necrosis, viz, coagulation, colliquation, caseation, and mummification, play no part in the diagnosis proper.—H. Prinz, *Dental Summary.*

Effective Method of Removing a Broken Reamer or Bur from a Root.—The following is a simple method for removing a reamer or bur broken and lodged in the recesses of a root-canal: Two thin but stiff nerve broaches are set into a broach-holder, and passed into the root one on each side of the broken reamer. If the latter hugs the root walls too firmly, a small round bur is used until the broaches can be passed between the fractured bur and the root walls. The broaches are then twisted around the obstinate fragment. The operation may not be successful in the first few attempts, but anyone who tries this method will be agreeably surprised to find how firm a grip the broaches take on the broken bur.—M. H. Feldman, *Dental Outlook.*

Teeth, Health, and Social Competency.—Industrial inefficiency frequently results from physical incompetency. The ills traceable to diseased teeth represent many days away from work. These lapses in production are sometimes the determining factor in a man's becoming dependent. If all men had steady work at reasonable wages, free from the burdening cost of sickness, the producing power of the individual would be sufficiently high to maintain him without contribution from tax levies. As it is, many of the preventable diseases lie at the root of poverty. While oral health is not urged as a panacea, undoubtedly the care and preservation of the teeth will increase the working efficiency of the individual, reduce preventable illness, and in many ways go toward making the individual economically independent.—E. F. Brown, *Health News.*

Sterilization of Impression Compound.—Various experiments have been made with a view to rendering used impression compound sterile. Microscopic examinations of quantities treated under various conditions and by the usually recognized methods showed that, unless the impression compound was thoroughly boiled, it could not be made sterile. The process of boiling, however, causes serious deterioration of the quality, making it almost useless for taking an accurate impression. The difficulty may be circumvented in the following way:

The modeling compound is placed in a receptacle in a dry vulcanizer, and the temperature is run up until the gage registers 230° F. The liquid mass is then poured into suitable molds, and upon examination it will be found that the mass is quite sterile and as serviceable as ever for taking impressions, etc.—*Elliot's Quarterly.*

"Daylight" Spectacles for Artificial Light, for Selecting Tooth Shades.—H. E. Ives, a Philadelphia physicist, who has been for some time investigating the production of light giving a daylight spectrum, has recently suggested the use of colored glass spectacles for viewing objects illuminated by artificial light when it is desired to see such objects exactly as they would appear in daylight. The glass is covered with a collodion or gelatin surface, stained with anilin dyes carefully selected to filter out the light-rays peculiar to artificial light. For each kind of

the latter a special formula is to be followed in preparing the spectacles. These spectacles are useful in many industries, as, for example, the making of artificial teeth, where color has to be most accurately matched. Many other dental uses, such as the selecting of shades in crown and bridge and plate work suggest themselves.—*Scientific American.*

Alveolotomy and Its Indications.—Alveolotomy is a much less formidable operation than its name implies: With a large, round bur the gums and alveolar process are drilled through to the apex of the tooth in question. The conditions where this treatment is indicated are as follows: The incipient stages of abscess formation with symptoms of pericementitis, when the tooth is so tender to touch that we are unable to operate on it; or when we are unable for some other reason, such as an obstruction in the root-canal, to reach the apex and permit the escape of the mephitic gases there confined. When pus has already formed, but as yet has not penetrated through the alveolar process, we secure a chance for its escape in this way and afford a great deal of relief. Before drilling through the alveolus, we may anesthetize the area with a local anesthetic, or we may dip the bur into phenol and depend upon the escharotic action of this drug to desensitize the tissues before it.—A. Berger, *Items of Interest.*

Easy Method of Withdrawing Wax Models for Cast Gold Inlays.—Great difficulty is sometimes experienced in removing the wax form from a cavity without distortion. The following simple method will be found to overcome all difficulties in this respect: A small 22-karat gold disk is made, about 1/8 inch in circumference, with a tiny hole in the center large enough to admit a cotton thread. A knot is made at one end of the cotton, and the free end is threaded through the hole in the disk. The disk is then dipped into molten wax several times, until it is about the size of a pea, whereupon it is pressed into the cavity and contoured. Over the free end of the cotton, a piece of metal tubing—a broken hypodermic needle serves very well—is slid down until it rests upon the wax inlay, to which it is tacked with a little sticky-wax. After being chilled, the wax inlay can easily be withdrawn from the cavity without injury.

In the heating-up process, the wax of course disappears as usual, but the disk is retained in the mold in the investment and forms part of the gold inlay, when the gold is cast.—S. A. Coxan, *Ash's Canadian Monthly Circular.*

Suggestions Regarding Nitrous Oxid and Oxygen Anesthesia and Analgesia.—Nitrous oxid analgesia and anesthesia differ from each other in degree only, the one being a continuation of the other, and as such we may obtain any necessary degree of anesthesia to meet a corresponding degree of pain. The sensations incident to analgesia should be utilized in strengthening mental suggestion in patients who are not easily controlled.

Asphyxia, the only danger in nitrous oxid anesthesia or analgesia, may be eliminated absolutely in the latter by administering at least eighteen to twenty per cent. of oxygen with the gas. A portion of this oxygen must come from a pure supply.

Air as a source of oxygen supply is insufficient to eliminate asphyxia in all cases; oxygen used alone is expensive; but a combination of air and oxygen makes the ideal diluting mixture for nitrous oxid analgesia.

Accurate rebreathing is a means of regulating the ventilation, stimulating it when insufficient for adequate absorption of gases in the lungs, and reducing the fresh gas consumption when the patient would over-ventilate if left alone. Incidentally, it saves gas and reduces the cost.—E. I. McKesson, *Ash's Monthly.*

Method of Firm Attachment of Vulcanite to Aluminum Dentures.—An aluminum plate with teeth attached by vulcanite forms a very light denture, comfortable to wear and of little bulk. It is well known, however, that after being for some time in use, the vulcanite is liable to separate from the aluminum, as the result of some chemical or electro-chemical action. A method of obviating a breakdown from this particular cause would probably lead many practitioners who have abandoned the combination to try it afresh. When the case is ready for rubber packing, the cleaned aluminum surface is coated with a thin solution of rubber in chloroform, and over this, when dry, is carefully packed a layer of weighted rubber. and the further filling of the mold space is completed with ordinary rubber. Those who have tried this method claim that the attachment between vulcanite and aluminum remains sound, and a stable union between the two is secured. A similar use of weighted rubber—of the metallic filling kind—was some years ago found very serviceable with the other metals in attaching teeth by vulcanite to "wire bar" lower cases; the resulting union was so very close and intimate that hardly anything short of filing or chiseling would effect their separation.—*Dental Record.*

Indications for Pulp Capping.—Pulp capping has quite generally been tabooed of late years by the profession, and yet in certain well-defined cases it is the best possible practice. Pulp capping is indicated in the following cases: When the tooth has given little history of pain and when the pulp has been only slightly exposed by instrumentation without being infected or subjected to infection by being bathed in the fluids of the mouth; in cases of young patients where we are not certain that the apical ends of the roots are completely formed; and in those cases of adults where there is any promise of saving the pulp in teeth the cavities of which are so located that it is difficult to reach the canals and properly treat and fill them without grinding or drilling away most of the crown. We may not always succeed in saving the pulp by capping, but we should at least try in the cases indicated, and we should have a frank understanding with the patient as to the possibility that we may fail.—C. N. Johnson, *Dental Review.*

Pulp Preservation in First Permanent Molars in Children.—We occasionally are called upon to devitalize the pulp in a first permanent molar before the root has been completed. When a patient presents with an exposed or hyperemic pulp in such a tooth, every effort should be made to treat so as to keep it comfortable for a time without destroying the pulp, in the hope that the apical foramen might still be narrowed down. Every effort should be made to reduce the hyperemia by the use of sedatives. The rubber dam is placed over the tooth, the cavity and tooth are washed with an antiseptic solution, overhanging walls of enamel are broken down, and all food and carious portions are carefully removed from the cavity. After the dentin has been sterilized by contact for several days with a dressing of eugenol or beechwood creasote and oxid of zinc paste, which has been carefully sealed in the cavity, the dam is adjusted, the dressing removed, and the pulpal wall covered with varnish—amber or Zanzibar gum cut in ether—over which a paste of oxid of zinc and eugenol is gently flowed.

All excess eugenol is absorbed away, and the whole is covered with oxyphosphate of zinc cement—a permanent filling to replace a portion of this later. Should the pulp be accidentally exposed while excavating, the varnish may be made to bridge the exposure and the capping made as above. Such a tooth will very often continue its development and perform its full duty as an organ of mastication. If pulp removal is found unavoidable, a radiograph should invariably be taken to determine the degree of development of the root. With this information at hand, it may be determined whether or not an attempt shall be made to save the tooth. —J. F. Stephan, *Dental Review.*

Removal of Upper Left Third Molar by Means of the Elevator.—Assuming that there are no teeth missing on the left side, and the third molar has to be removed, this is invariably difficult to see, because in persons who possess the complete number of teeth the masseter muscles are often constricted and the mouth cannot be opened wide, added to which there is perhaps elongation of the second molar. The region should be carefully examined with mirror and probe to make quite certain of position and solidity. If location of the root and flexibility of the lips and cheek allow, a straight elevator should be used; if they do not allow, the obtuse-angle elevator should be employed. The operator—standing, of course, on the right side of the chair—should rest the patient's head in a position comfortable for operating, but not reclining too much. The operator's left arm should be fixed firmly round the patient's head, and the left forefinger should rest on or near the second molar—a position suitable for lifting the lips and cheek and giving a clear view. Further, the operator's head should be bent forward over the patient, and the elevator should be grasped firmly in the hand, the thumb extending along the blade to within three-quarters of an inch of the point, or as near this as possible, to insure full control of the blade and to avoid the possibility of accident from slipping, etc. The elevator should be fixed at almost a right angle to the root, and nearly horizontal, pressed well home so as to depress, and even cut through, when necessary, the outer wall of bone. Leverage alone should not be depended upon, but the point of the elevator should be depressed and both the neck of the second molar and the bony process by the gum margin should equally share in distributing the force or fulcrage necessary. The root should be pressed downward and slightly outward, never directed backward. By such action the tooth will be forced out toward the cheek and easily removed with the finger.—T. Quinlan, *Ash's Monthly.*

HINTS, QUERIES, AND COMMENTS.

SHEETING WAX.

SHEET wax is often prepared by dipping strips of glass into the melted wax. But to prevent the wax from sticking to the glass, the latter must be in such condition that a pellicle of water will adhere to its surface. It is not so easy to maintain this condition, especially if any resinous matter is incorporated with the wax. Moreover, vertical dipping produces sheets of varying thickness, thin above and thicker below. Soft, non-resinous woods, such as basswood, white-wood, or white pine, retain a water-coated surface better than glass, and by following the process detailed below, sheets may be obtained of a fairly even thickness throughout. Three pieces are cut out from a thick board, one inch or one inch and a quarter thick, of the size of the wax sheets desired, and smoothed up nicely all around. A handle is attached to one of the flat surfaces of each piece; an ordinary drawer-knob, or a wire handle such as is used on screen doors, will answer. These pieces are soaked in water and used alternately.

The wax is melted in a pan, larger than the dimensions of the dipping boards. A wet board is held over the wax, inclined so that one edge will enter the wax first. A rocking motion is produced, so that the edge which enters the wax first will be the first to leave it, and this edge is held above the wax for the melted wax to drain off. Then the board is dipped again, letting the edge which last left the wax be the first to enter it. To increase the thickness of the sheet, this process is repeated. The board and wax are put into cold water, using the other boards while the first one cools.

If the boards are well wetted before using them, the wax will never stick to them, and sheets of uniform thickness will be found preferable for laboratory use.

A good quality of beeswax to which a third of its weight of paraffin and about one ounce of Burgundy pitch to the pound of the mixture has been incorporated, will be found preferable to pure wax for laboratory use. A part of the wax is melted without water, heating it somewhat hotter than boiling water, and the Burgundy pitch is added, as the melting-point of the latter is rather high. When the pitch is incorporated, the mixture may be poured into the remainder of the wax and paraffin, and all of it can be melted over water, as usual.

S.

A PALATAL SUTURE-OPENER FOR UPPER EXPANSION.

THE appliance for the expansion of the dental arch which, in my opinion, meets almost every requirement of the specialist is the Angle "new appliance," but as it requires special training in technique and a great deal of experience to properly use it, I am offering an appliance which may be valuable to the general practitioner, if not to the specialist.

There are many very deep palatal vaults where it is impossible, by simply expanding the teeth alone, to obtain sufficient development of the palate to accommodate the tongue, and I have found that in these cases a split-plate is advantageous.

The appliance shown in Fig. 1 was used by me in the treatment of a girl who had lost the first molars; the palatal vault was deep, with a very narrow arch, the left nostril almost closed, and the nose disfigured. As the patient had great difficulty in breathing, and her health was impaired, I deemed it imperative to give her relief at once, and not wait for the eruption of the second molars.

The bicuspids alone being in position, I did not believe that sufficient development or broadening of the arch could be accomplished by simply expanding them. An appliance (as shown in Fig. 1) was constructed, and the patient wore it with great comfort. All that was necessary at each sitting was to spring the lateral halves apart, and snap the appliance into position.

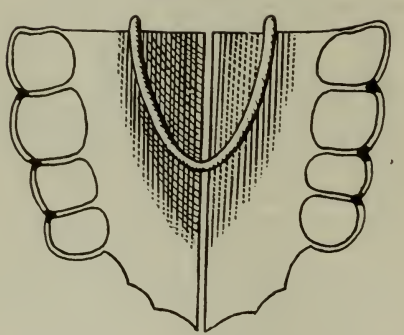
The result of the treatment was an arch sufficiently wide to accommodate the tongue, an opened nostril, no difficulty in breathing,

and great improvement in the health of the child.

The appliance is constructed in very much the same manner as a Jackson appliance,

Fig. 1.

Fig. 2.



with the exception that the lingual plates are not used, allowing the vulcanite to take their place. The wires forming the spring clasps and base wire are so arranged that the vulcanite will engage them securely.

In Fig. 1 the base wire is placed beyond the posterior border of the plate, as the molars were not in position. By making a base wire such as is used in a lower Jackson appliance, and placing it as shown in Fig. 2, the anterior and posterior expansion can be controlled at will.

This appliance is a modification of the Jackson or Ottolengui suture-opener and the Coffin split-plate, but it is more efficient, hygienic, and easier to manipulate than the last two mentioned.

W. A. White, D.D.S.

Atlanta, Ga.

RECEPTACLE FOR STERILIZING PULP BROACHES, BURS, ETC., BY FORMALDEHYD.

The difficulties encountered in the sterilization by any of the wet methods of pulp broaches, burs, and similarly delicate dental instruments are largely responsible for the omission of this essential precaution on the part of many practitioners. Sterility can be obtained if all débris is carefully brushed out from the bristles, grooves, or blades of such instruments, and these are preserved in a shallow tobacco jar with a hollow glass knob in the lid which, when filled with a small wet sponge, serves as a humidor. In this hollow glass knob a few tablets of formaldehyd are inserted and held in place by a wad of dry cotton, the evaporating formaldehyd sterilizing the instruments if they are kept long enough under the action of the gas. Enough instruments should be kept in the jar, of course, to allow of the employment of a freshly sterilized one for every case, as the gas must be allowed to act upon them for some time to produce the desired sterility. Even newly purchased broaches, burs, etc., should be subjected to such sterilization, as they are not sterile when removed from their packing. Vastly better results in root-canal treatments will amply repay the small trouble occasioned by this simple precaution.

Richard H. Riethmüller, Ph.D., D.D.S.

SAVING TIME IN MAKING PLASTER CASTS.

A strip of cardboard bent around the impression, with the two overlapping ends pinned together, produces a beautifully finished cast and saves a great deal of time otherwise consumed in trimming the cast. The cardboard can be cut to any width according to the desired thickness of the cast. After the plaster cast has been poured, the plaster is leveled off to the margins of the cardboard, which is removed when the plaster has sufficiently set, producing a very pleasing result in regard to smoothness of the cast.

Wright B. Lee, D.D.S.

Eugene, Oregon.

OBITUARY.

DR. JAMES TRUMAN.

[See Frontispiece.]

Died, from an attack of œdema of the lungs, at his home in Philadelphia, November 26, 1914, James Truman, D.D.S., LL.D., in his eighty-eighth year.

Dr. Truman had for some time been suffering from the infirmities of advancing age, but although physically enfeebled he retained the normal clearness and activity of his intellectual faculties until failure of respiration ushered in the unconsciousness which rapidly led to his death.

Following is his biography as prepared by himself some years ago, at the request of the Editor of the Dental Cosmos:

[*Autobiographical Sketch.*]

Dr. Truman was born at Abington (Jenkintown) a suburb of Philadelphia, November 22, 1826. When he was two years of age, his parents, George and Catharine L. Truman, returned to Philadelphia, where the family had resided for many generations, its original founder having emigrated from England with William Penn.

Upon the completion of his general education he commenced the study of dentistry with his father, a practitioner of both medicine and dentistry, and then went into practice. This was continued, with some interruptions, until his final graduation at the Philadelphia College of Dental Surgery in 1854. In 1855 he removed to Waterloo, in western New York, where he practiced for three years, returning to Philadelphia in 1858. In 1864 he accepted the position offered him of demonstrator-in-chief of operative dentistry in the Pennsylvania College of Dental Surgery.

The efforts of the earlier workers in this country had been devoted mainly to developing the mechanical side of dentistry, leaving scientific deductions to a future growth. This was at the time unavoidable, but unsatisfactory. Dr. Truman was fully impressed with the importance of extending the scope of inquiry into many unsolved problems. He spent much time in the study, through dissection and otherwise, of the teeth of inferior forms, and this led to a careful examination of the supplemental and supernumerary forms of the human series of teeth, and he subsequently presented a paper on this subject which received recognition both at home and abroad.

He spent much time in an effort to solve the problem of bleaching teeth. There had been some effort in this direction by others with no practical results, and discolored teeth were either permitted to remain a disfigurement or were extracted. The difficulties surrounding examinations in this direction can only be appreciated by practical investigations, but those made by the subject of this sketch finally resulted in a process more satisfactory than any previously applied. The general manipulation of such teeth, and the preparation of the canals, was carefully considered, and while changes in the process of bleaching have been made, the general plan of preliminary treatment remains as he gave it in 1868. It, however, continued for twenty-five years to be an operation subject to much criticism, and one rarely attempted. At present, through the use of other agencies than were originally adopted, the process has become an accepted part of operative dentistry.

The need of a system of preparing cavities in the teeth for filling with cohesive gold very early claimed Dr. Truman's attention, and efforts were made to meet this want. His ideas in this direction were formulated in an article in the *Dental Times*, in which he endeavored to reduce the operation to mechanical principles, systematizing the formation of anchorage and making the preparation of the cavity the important basis of successful work. The views of dentists upon this subject have undergone considerable changes since that period.

In 1865 Dr. Truman was elected to fill the chair of "dental physiology and operative dentistry" in the Pennsylvania College of

Dental Surgery, and held that position until his resignation in 1876.

It was during his connection with this college that the question of woman's place in dentistry caused much disturbance in the faculty. Prior to 1869 dentistry was regarded as wholly unfit for women to practice, indeed it was not regarded as one of the occupations which at any time would be attractive to her. The feeling against any change from what had been regarded as her proper sphere was still operating powerfully against her success in medicine.

The peculiar adaptability of women for dentistry as an occupation had long claimed Dr. Truman's earnest consideration, and being fully satisfied that it would furnish an agreeable and remunerative calling for many, he determined to openly advocate it. To this end he incorporated his views in a valedictory to the graduating class delivered to a large audience in Musical Fund Hall, Philadelphia, in 1866. This created some sensation and placed him at once in antagonism with the faculty and generally with the dental profession.

It was not until 1869 that an opportunity occurred to put in practical operation the theories then enunciated. Application was made that year by Mrs. Henriette Hirschfeld-Tiburtius of Berlin, Germany, to be permitted to matriculate as a student. She had come to America highly recommended. The struggle for admission was a memorable one, but was successful, and she finally graduated and returned to her native country to enter upon a remunerative practice. In 1866 a woman, Mrs. Lucy Hobbs-Taylor, had graduated from the Ohio College of Dental Surgery. These two constituted the only two women in the world possessing the diploma of a dental college.

The importance of this matter, as Dr. Truman regarded it, led him to introduce a resolution in the American Dental Association convened at Saratoga, August 1869, asking for "recommendation to subordinate associations to admit to full membership any women duly qualified." This was laid on the table—a result anticipated by the mover, and while its introduction led to no immediate change in the feeling of antagonism to women in dentistry, it did make eventually a marked impression upon the thought of the profession, and led up to the opening of nearly all dental college doors to women. The immediate result, however, was much bitter feeling in professional circles, which reacted upon the originator of this movement. Time has changed all this, and women are now practicing dentistry in all parts of the civilized world; the United States has a dental organization composed wholly of women, and several women have become leading scientific workers, devoting their time to the elucidation of many unsolved problems.

While connected with the Pennsylvania College of Dental Surgery Dr. Truman became editor of the *Dental Times*, a position he continued to fill for four years. Nearly all the productions of his pen during this period were published in that journal.

The use of the mallet in dental filling operations had, up to that time, given such peculiar and varying results that he determined to commence investigations in that direction. This involved the preparation of instruments, and months of careful work. The results were given to the dental profession, establishing very conclusively that the then much-lauded lead mallet was not equal to the light steel mallet, and that the electro-magnetic mallet of Bonwill, then in its infancy, was far superior to all other mallets, as it entirely overcame mobility. These conclusions have never been contradicted, time simply enforcing the principles then demonstrated.

The use of tin as a filling material had for an indefinite period been part of the armamentarium of the dental profession, but Dr. Truman regarded the methods adopted as defective and the material as not properly prepared. He made extended experiments with tin in various forms—rolled tin, chipped tin from block, etc.—to secure the greatest amount of cohesion. It was proved that the old method of using tin upon the non-cohesive principle was defective, and that the best results could be obtained by depending upon the slight but effectual cohesive property of the metal.

In 1876 his health was so much broken by persistent efforts in various kinds of work that he concluded to make an entire change, and accepted what seemed a favorable offer at Frankfurt a/M., Germany, and removed his family to that city in the same year, resigning his position in the Pennsylvania College of Dental Surgery. The condition of things at Frankfurt not meeting his expectations, he left that city in the winter of 1877 and established himself in the city of Hanover.

He was there received with confidence by the better class of citizens, but was subject to much annoyance by the jealousy of members of the dental profession. His practice,

notwithstanding, grew rapidly among the nobility and wealthy residents of the province. In 1880 the death of his wife made life in Germany unbearable, and he returned to America and commenced practice in Philadelphia.

On February 28, 1877, the honorary degree of D.D.S. was conferred upon him by the Pennsylvania College of Dental Surgery.

His pen was active from this period as a contributor to dental periodicals in original articles, reviews, and translations. He was one of the associate revisers of the American edition of Tomes' Surgery, and also at a later period became a contributor to the "American System of Dentistry."

In 1882 he was elected professor of dental pathology, therapeutics, and materia medica in the Department of Dentistry of the University of Pennsylvania. In 1883 he was made secretary, and subsequently dean, which position he held until he retired in 1896.

In 1890 he was chosen to conduct the editorial work of the *International Dental Journal*, published solely by dentists to advance the interests of the dental profession. He continued to be editor of that journal until it ceased publication in 1905. His contributions to the literature of the profession have been mainly confined to work upon dental periodicals, with the exception named and as a contributor to the "American Text-book of Operative Dentistry."

He was a member of various dental associations of America and Europe, and was one of the four who issued the original call for the formation of the National Association of Dental Faculties, which was subsequently organized in 1884 at New York and by adjournment to Saratoga. He has filled various offices of responsibility in this body, having been its president one year. He was the last president of the American Dental Association, and assisted in its transfer to the National Dental Association. This was perfected by the union of the Southern Dental Association and the American Dental Association.

He received the honorary degree of LL.D. from the University of Pennsylvania in 1904.

In 1909 he retired from active teaching and was made professor emeritus of dental pathology, therapeutics, and materia medica in the University of Pennsylvania, the title of the chair he had actively and efficiently filled for a period of twenty-seven years.

The passing of Dr. Truman removes one of the commanding figures from the rapidly diminishing group of men who are fairly entitled to be designated as the pioneers of organized professional dentistry. Dr. Truman entered upon the active practice of his profession fourteen years after the establishment of the first institution in the world for the systematic training of dental students. Previous to that time the only means for obtaining an education in dentistry was through the system of apprenticeship then in vogue, at which time, and for many years thereafter in its professional infancy, the practice of dentistry was little more than a trained handicraft. Moreover, its practice was distinctly handicapped by the ideal of commercialism. The possibilities of its scientific development were unrecognized, excepting by a small minority of its more prominent exponents. It was those conditions and that professional atmosphere that confronted Dr. Truman as a novitiate in the ranks of dental practitioners when he received his qualification to practice his profession in 1854. His reaction to the surrounding professional conditions of his time was characteristic. His larger vision recognized the intrinsic possibilities of his professional calling, and it became his life-problem to demonstrate by his work, by his educational efforts, by his contributions to the literature of his profession, and by his active participation in the deliberations of dental professional associations, his convictions as to the larger possibilities of usefulness which dentistry had to offer to mankind. He brought to the solution of his problem a commanding personality, a vigorous, even at times aggressive intellectuality, a masterly command of the English language, and a dignity and forcefulness of mind which inevitably carried conviction with his utterances.

Dental literature contains no more striking example of impressive oratory than the apotheosis of anesthesia pronounced by Dr. Truman at the banquet given in Philadelphia upon the occasion of the celebration of the fiftieth anniversary of the discovery of nitrous oxid anesthesia by Horace Wells. It is not only a literary classic, but an utterance characteristic of the spirit and ideals of its author.

His unfailing energy, and above all his honesty of purpose, crowned his life's work with success, and he lived to see his chosen calling elevated from the status of a mechanic art to the dignity of a recognized profession. The larger service of his life has been that rendered to dental education, the major portion of which has been given through his service to the Dental School of the University of Pennsylvania. Quite apart from the value of his teachings from the technical standpoint, the influence which as a teacher he exerted over the moral life and the ethical professional standards of his students was invaluable. It was the deep and genuine interest that he felt in the moral development and spiritual growth of his students that served to establish such close and intimate relations between him and those whom he taught. No student who had benefited by his instruction failed to reverence him as a father and friend; even the wrongdoer whom, as dean of the dental school, he was obliged to reprimand, received his admonitions without resentment, for there was always that in his manner which gave assurance that he corrected without malice and with a single eye to helpfulness. If he ever had enemies they were such as were an honor to him, for none who came into contact with him sufficiently to realize the character of the man ever failed to love him.

The loss of Dr. Truman will be mourned wherever dentistry is known and practiced throughout the civilized world, for he was one of the makers of dentistry and one of the best exponents of its larger possibilities.

It was his specific request personally made to the writer that no reference to his religious views should be published; but without breach of trust, one may be permitted to quote here a statement made by his colleague and almost lifelong friend, Dr. Darby, in connection with his funeral services. Dr. Darby said, "I have never crossed the river of death; I know not (except by the eye of faith) what is beyond the farther shore; but if nobility of character, righteous living, love of mankind and love of justice, charity for all mankind without envy or malice, count for anything as prerequisites for citizenship in that country, then my dead friend will be there."

DR. THOMAS EDWARD TURNER.

Died, November 14, 1914, at St. Louis, Mo., from an accident, in his forty-seventh year, Thomas Edward Turner, D.D.S.

Thomas Edward Turner was born in Carrollton, Mo., June 22, 1868. He was educated in the public school and high school of that city, and was a clerk in the Missouri legislature at Jefferson City for several years.

He began the study of dentistry in the office of Dr. J. S. Hassell of Carrollton, and entered the Missouri Dental College, now Washington University Dental School, in September 1888, graduating in the class of 1890. Immediately after graduating he located in Neosha, Mo., for several years, and in that city married, September 21, 1892, Miss Mary Lee Moss, who survives him. He came to St. Louis about 1896, and entered into partnership with Dr. Holmes; the partnership continued until 1900, when it was dissolved, Dr. Turner continuing in practice alone until November 14, 1914, when he was accidentally killed while cranking his automobile.

Soon after graduation he became a member of the Missouri State Dental Association, and he was elected vice-president in 1914. After moving to St. Louis he connected himself with the St. Louis Dental Society, and was its president in 1903. In 1904 Dr. Turner was appointed a member of the Missouri State Board of Dental Examiners, which position he retained to the time of his death. He enjoyed the distinction of being the only democrat reappointed on the board by a republican governor. His work on the board was such that through his efforts St. Louis, the fourth largest city in the United States, enjoys the distinction of being freer from dental quackery than any other city of similar size in the country. He was especially active in all the meetings of the National Association of Dental Examiners and the National Dental Association during the last ten years. He was president of the National Association of Dental Examiners in 1912, and third vice-president of the National Dental Association at the time of his death. He was a member of the Masonic Fraternity, being a past-master of Rose Hill Lodge, No. 550.

The work of Dr. Turner, since he located in St. Louis, has been of such a character as to attract the attention of the profession, not

only in his own state but throughout the country. In the death of Dr. Turner the dental profession has sustained a loss that will be hard to fill—just how hard, only those who knew him best and loved him most can tell. His professional ability and his modest Christian character endeared him to a host of friends, who mourn most sincerely with his bereaved widow and family.

J. H. Kennerly.

Death of Dr. Louis Jack.

We have received notice of the death, on December 9th, in his eighty-second year, of Dr. Louis Jack. He was the last survivor of the class of 1854 of the old Philadelphia College of Dental Surgery, of which Dr. James Truman—of whom an extended notice is given in the preceding columns—was also a member.

Society Notes and Announcements.

PANAMA-PACIFIC DENTAL CONGRESS.

The Committee of Organization of the Panama-Pacific Dental Congress wishes it distinctly understood that the Panama-Pacific International Exposition will not be postponed, but will open on time, as will also the Panama-Pacific Dental Congress. The authority for this statement is impressed in the following letter from President Moore of the Exposition Company:

To the Commissioners from Foreign Nations and from the States and Territories of the United States to the Panama-Pacific International Exposition.

Gentlemen,—There have been reports that the Exposition, because of the war in Europe, would be postponed. It will not be postponed. There have been published statements that the war in Europe would seriously affect the commercial or educational importance or the financial success of the Exposition. They will not be so affected.

The Exposition will open on its scheduled date—February 20, 1915. It will be completely ready when opened. It is more than ninety per cent. completed today. Nothing will be permitted to interfere with the consummation of the plans originally laid down.

Many friends and parties in interest have presented arguments in support of postponement for a year. These have been given anxious study and careful analysis. Most of them are merely counsels of timidity, based on nothing save a general feeling of doubt and uncertainty. These are sufficiently answered by saying that there is no longer any doubt or uncertainty as to the success of the Exposition, whatever the situation in Europe may be. Other arguments for postponement have some practical foundation, but for every one of these there is a stronger and better argument for proceeding with our plans. Not one of the nations at war has notified us of an intention to withdraw her participation; in fact, France and Italy notify us that their plans remain unchanged; even if we should lose the others, the interest and importance of the Exposition would still, as a whole, surpass all precedent.

As to the domestic participation, the effect of the European war seems likely to be rather advantageous than otherwise. The stimulus on exhibits is already felt, as American manufacturers become impressed with the opportunity given by the Exposition for bringing their goods to the attention of the large distributers of Central and South America, the Orient, and Canada.

Expert opinion agrees that there is nothing in the situation to affect seriously the willingness or ability of the people of the western hemisphere and of the far East to visit the Exposition. The decision of the Exposition

management has, however, been reached without regard to that consideration. We consider it our duty alike to our nation, to the participating nations, to our exhibitors, and to ourselves, to carry out the plans as originally laid down—which, now nearly at fruition, promise the most important, the most beautiful, and the most successful Exposition in history.

CHAS. C. MOORE, *President.*

At the present time matters relating to the PANAMA-PACIFIC DENTAL CONGRESS are most encouraging. The attendance so far as can be judged by the expressions of those who attended the meeting of the National Dental Association in Rochester, and the meeting of the New Jersey State Dental Society, will break all previous records. Everyone said he was coming. The Committee of Organization wishes to assure all prospective members that they will be well cared for in every way.

COMMITTEE OF ORGANIZATION.

AMERICAN MILLER MEMORIAL.

TO THE DENTAL PROFESSION OF AMERICA:

The committee appointed by the Ohio State Dental Society at the 1909 meeting for the purpose of raising funds for an American Memorial to the late Dr. W. D. Miller desire to make the following report:

Funds have been received from the following states: Alabama $25.00, Arizona $25.00, Arkansas $50.00, California $60.00, Colorado $82.00, Connecticut $50.00, Georgia $60.00, Illinois $531.00, Iowa $200.00, Indiana $75.00, Kansas $134.50, Kentucky $105.00, Maine $25.00, Massachusetts $100.00, Michigan $300.00, Minnesota $100.00, Missouri $100.00, Montana $15.00, Nebraska $100.00, New Hampshire $25.00, New Mexico $25.00, New York $125.00, Ohio $1303.00, South Carolina $25.00, North Dakota $50.00, South Dakota $15.00, Oklahoma $31.00, Oregon $50.00, Pennsylvania $20.00, Tennessee $50.00, West Virginia $25.00, Washington $50.00, Wisconsin $25.00, Wyoming $10.00, Texas $50.00, Utah $14.00, Vermont $20.00, Virginia $50.00. Total $4300.50; interest on this fund to December 1, 1913, amounts to $382.94, making a total in the hands of the treasurer, Dr. Weston A. Price, of $4683.44. Florida and Mississippi have each voted $50.00, but the amounts are not in the treasurer's hands at this date.

The memorial will consist of an 8-foot bronze statue of Dr. Miller mounted on a 7-foot granite pedestal, to be placed on the lawn of the public library, the most appropriate site in the city of Columbus, the capital of Dr. Miller's native state. Suitable tablets will be prepared, and it is the desire of the committee to state on one of them that the monument is erected by funds from every state in the Union. If your state is not represented in the above list, we want your co-operation in placing it there.

It is hoped that sufficient funds—$5500.00—will be in the treasury that steps can be taken at once toward the construction of this memorial, so that it may be finished and ready for unveiling at the 1915 meeting, which will be the fiftieth anniversary of the Ohio State Society. The valuable co-operation of the honorary committees in the several states is hereby acknowledged; they have made this memorial a reality.

Other professions have done honor to their distinguished dead; let us do the same for Dr. Miller, whose life was one of unselfish devotion to the scientific advancement of dentistry.

Yours very truly,

EDWARD C. MILLS, *Chairman,*
J. R. CALLAHAN,
S. D. RUGGLES,
Committee.

COLUMBUS, OHIO, April 7, 1914.

NATIONAL MOUTH HYGIENE ASSOCIATION.

A SERIES of illustrated lectures on Mouth Hygiene is being prepared by this association for rental service. The first lecture of the series, a talk suitable for a mixed adult audience or school pupils above the age of twelve years (designated as lecture "A") is now ready. The lecture set (manuscript and 36 slides) will be furnished to members of state dental societies and others who may be considered as competent to present the matter to the public, at a fee of One Dollar per use.

For further particulars and application blanks, address the Director of Extension Lectures,

EDWIN M. KENT, D.M.D.,
222 Washington st., Brookline, Mass.

DENTAL FACULTIES ASSOCIATION OF AMERICAN UNIVERSITIES.

THE Dental Faculties Association of American Universities will meet on February 24 and 25, 1915, in the Thomas W. Evans Museum and Dental Institute, at Fortieth and Spruce sts., Philadelphia, Pa.

EDWARD C. KIRK, *Sec'y.*

AMERICAN INSTITUTE OF DENTAL TEACHERS.

THE annual meeting of the American Institute of Dental Teachers will be held at Ann Arbor, Mich., January 26, 27, and 28, 1915.

There will be a number of interesting papers, reports, and discussions by prominent dental educators. All dental teachers are cordially invited to be present.

J. F. BIDDLE, *Sec'y,*
517 Arch st., N. S. Pittsburgh, Pa.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE National Association of Dental Faculties will hold its meeting on January 25 and 26, 1915, at Ann Arbor, Mich. Headquarters, Allen Hotel.

This meeting will precede the Teachers' Association meeting, which will be held January 26th, 27th, and 28th.

Besides the regular business there will be several papers of interest to educators read before the association.

The Executive Committee meets at nine o'clock, on Monday, January 25th. Regular session will open at ten.

B. HOLLY SMITH,
Ch'mn Executive Committee,
CHAS. C. ALLEN, *Sec'y.*

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

A REGULAR meeting of the Academy of Stomatology will be held at the College of Physicians, Twenty-second st. below Market, on Tuesday, January 26, 1915, at 8 P.M.

Arthur Hopewell-Smith, L.D.S., M.R.C.S., L.R.C.P., will present a paper entitled "Pain and Other Oral Sensations."

DUDLEY GUILFORD, *Sec'y.*

CHICAGO DENTAL SOCIETY.

ANNUAL MIDWINTER MEETING.

THE annual midwinter meeting of the Chicago Dental Society will be held in the Hotel La Salle, January 29 and 30, 1915.

Friday, 29th.

Friday, January 29th, Dr. Robert B. Preble will read a paper entitled "Diagnosis of Systemic Disturbances Due to Oral Infection." Dr. Preble is a physician, and one of the leading diagnosticians in America. The paper will be of practical interest to members of both the medical and dental professions. On the same date, Dr. Elmer E. Best will present a paper entitled "The Surgical Treatment of Pulp-canals as a Preventive of Systemic Disturbances." Dr. Best has made a special study of this phase of the subject, and will give us something revolutionary in character.

Saturday, 30th.

Saturday, January 30th, will be devoted to clinics. The clinicians will be so arranged that one can see to the best advantage the clinic in which he is especially interested.

BANQUET.

The meeting closes with a banquet Saturday evening, at which there will be speakers of national reputation and other attractions of equal interest to the audience.

The exhibitors' display room will be open during the entire meeting.

T. L. GRISAMORE, *President.*
P. B. D. IDLER, *Sec'y.*

HARVARD DENTAL ALUMNI ASSOCIATION.

A SPECIAL meeting of the Harvard Dental Alumni Association will be held at the Harvard Union, corner of Harvard and Quincy sts., Cambridge, Mass., on Thursday, January 14, 1915, at 6 o'clock. Dinner will be served at 7 o'clock; tickets $1.50 each.

Each of the graduates of the school is cordially invited to attend, whether or not he is a member of the association. After dinner we will hear something about Harvard athletics, and we have the promise of the use of the reel of moving pictures of the last Yale game.

HAROLD DEW. CROSS, *President,*
FRANK T. TAYLOR, *Sec'y.*

WASHINGTON UNIVERSITY DENTAL SCHOOL.

ALUMNI ASSOCIATION.

THE forty-ninth annual clinic of the Alumni Association of the Washington University Dental School will be held on Monday and Tuesday, February 8 and 9, 1915, in St. Louis, Mo. Papers of interest to the progressive dentist will be read. The Executive Committee is making every effort to have this meeting one where the practical as well as scientific side of modern dentistry shall be shown. Mark off the dates—come—get new inspiration. All ethical dentists cordially invited.

H. M. FISCHER, *Sec'y*,
St. Louis, Mo.

MINNEAPOLIS DISTRICT DENTAL SOCIETY.

THE Minneapolis District Dental Society will hold its annual meeting on February 11, 12, and 13, 1915, in the City Hall, Minneapolis, Minn.

The first two days will be devoted to progressive clinics, papers, and exhibits, and the third day to an office-to-office clinic.

Everything points to a most successful meeting, so reserve the time now.

HARRY W. NELSON, *Sec'y*,
Minneapolis, Minn.

CONNECTICUT STATE DENTAL ASSOCIATION.

THE fifty-first annual meeting of the Connecticut State Dental Association will be held at Hartford, Conn., April 20, 21, and 22, 1915.

CHARLES H. RIGGS, *President*,
Hartford, Conn.
ELWYN R. BRYANT, *Sec'y*,
New Haven, Conn.

MASSACHUSETTS DENTAL SOCIETY.

THE fifty-first annual meeting of the Massachusetts Dental Society will be held May 5, 6, and 7, 1915, in the Hotel Somerset, Boston, Mass.

A. H. ST.C. CHASE, *Sec'y*.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE forty-seventh annual meeting of the Dental Society of the State of New York will be held at Albany, N. Y., Thursday, Friday, and Saturday, May 13, 14, and 15, 1915.

The Executive Council will meet at the Hotel Ten Eyck, Wednesday afternoon, May 12th, at 3 P.M., for the transaction of business in the interests of the society.

The first regular session of the society will open on Thursday at 10.30 A. M. The literary program will be rendered in the auditorium of the Educational Building. Headquarters for Officers and Executive Council will be at the Hotel Ten Eyck.

The clinics and exhibits will be at the Hotel Ten Eyck. Exhibitors are cordially invited to visit this meeting, and requested to make early reservations for space. Address Dr. O. J. Gross, Schenectady, N. Y., for space.

A cordial invitation is extended to all ethical dentists in New York and sister states.

A. P. BURKHART, *Sec'y*,
52 Genesee st., Auburn, N. Y.

INDIANA STATE DENTAL ASSOCIATION.

THE next annual meeting of the Indiana State Dental Association will be held on May 18, 19, and 20, 1915. A distinctive feature of this meeting will be that the program will be made up exclusively of Indiana dentists. A cordial invitation is extended to members of other dental societies to attend the meeting.

A. R. ROSS, *Sec'y*,
Lafayette, Ind.

ARIZONA STATE DENTAL SOCIETY.

THE sixth annual meeting of the Arizona State Dental Society was held at Phœnix, Ariz., November 11, 12, and 13, 1914.

The following officers were elected for the ensuing year: H. H. Wilson, Phœnix, president; L. A. Hawkins, Jerome, vice-president; J. L. O'Connell, Phœnix, secretary-treasurer.

J. L. O'CONNELL, *Sec'y*.

FLORIDA STATE DENTAL SOCIETY.

At the annual meeting of the Florida State Dental Society, held at Atlantic Beach Hotel, Atlantic Beach, Fla., July 1, 2, and 3, 1914, the following officers were elected for the ensuing year: W. E. VanBrunt, Tallahassee, president; R. C. McClellan, Fort Meade, first vice-president; O. R. Cheatham, Jacksonville, second vice-president; A. M. Jackson, Lakeland, recording secretary; Alice P. Butler, Gainesville, corresponding secretary; F. S. Robinson, Jacksonville, treasurer. Executive Committee—Jesse L. Williams, Jacksonville, W. K. Bradfield, St. Petersburg, A. M. Jackson, Miami, D. B. Morris, Gainesville, and M. C. Izler, Ocala.

The place and date of the next annual meeting will be announced later.

Alice P. Butler, *Cor. Sec'y*,
Gainesville, Fla.

CHATTANOOGA (TENN.) DENTAL SOCIETY.

The annual business meeting of the Chattanooga (Tenn.) Dental Society was held recently, during which the following officers were elected: William F. Stone, president; N. C. Hunt, vice-president; I. R. Stone, secretary; George W. Wagner, treasurer.

A paper read by Dr. R. S. Henry on "Vaccine Therapy in Oral Infections" provoked much interesting discussion.

The society is planning to give semi-annual banquets, to which dentists of national reputation will be invited, to deliver scientific addresses. This organization is characterized by qualities of life and progressiveness, the latter being demonstrated by the members' desire to keep in touch with the latest thought and discoveries in connection with their profession, by hearing the principal exponents thereof in their own midst. Incidentally, they anticipate little trouble in getting the men they desire to hear to visit Chattanooga, a very attractive place on account of its historic and scenic wonders, such as Lookout Mountain, Chickamauga Park, Missionary Ridge, Signal Mountain, the beautifully winding and picturesque Tennessee river—every one of them in some way identified with stirring events of the civil war.

Hal F. Wiltse, *Ass't Sec'y*.

BOARD OF EXAMINERS FOR PHILIPPINE ISLANDS.

The next regular meeting of the Board of Dental Examiners for the Philippine Islands to examine applicants for license to practice dentistry in the Philippines will be held in Manila, January 5, 1915. Only those who have diplomas from reputable and legally incorporated dental colleges are eligible to examination.

Louis Ottofy, *Sec'y*, Manila, P. I.

DISTRICT OF COLUMBIA BOARD OF EXAMINERS.

The next examination of applicants for license to practice dentistry in the District of Columbia will be held at the George Washington University, January 4, 5, 6, and 7, 1915. Applications should be in the hands of the secretary two weeks before the date of examination. Fee $10.

Starr Parsons, *Sec'y*,
1309 L st., N. W., Washington, D. C.

SOUTH DAKOTA BOARD OF EXAMINERS.

The South Dakota State Board of Dental Examiners will hold its next meeting at Sioux Falls, S. D., January 19, 1915, at 9 A.M. sharp, continuing three days. All applications for examination can be made with the secretary on January 18th, at the above address. Fee $25.00.

Aris L. Revell, *Sec'y*, Lead, S. Dak.

MONTANA BOARD OF EXAMINERS.

The Montana State Board will hold a session for the examination of candidates on the second Monday in January 1915.

G. A. Chevigny, *Sec'y*, Butte, Mont.

IDAHO BOARD OF EXAMINERS.

The next meeting of the Idaho State Board of Dental Examiners for the examination of candidates will be held at Boise, Idaho, commencing Monday morning, January 4, 1915, at 9 A.M. For application blanks and particulars write to

Albert A. Jessup, *Sec'y*,
Box 1414, Boise, Idaho.

NEW SOUTH WALES.

AMENDING THE DENTISTS' ACT OF 1912.

A BILL has been introduced in the Legislative Council of New South Wales to further regulate practice in dentistry, and to amend the Dentists' Act of 1912. The bill provides that—

Any registered dentist who makes use of any title or description which has not been conferred upon him by some duly qualified body shall be deemed guilty of infamous conduct in a professional respect.

Any person who for five years immediately preceding the act going into force has solely and continuously practiced dentistry in New South Wales, on his own account, may, for three years after such commencement of the act, continue so to practice; and if before the expiration of such three years he passes before the board an examination in surgical and mechanical dentistry, and materia medica (dental), he shall be entitled to registration under the act.

Operative assistants for five years, who also pass the examinations, shall be entitled to registration. Two years' practice preceding the act shall entitle a person to serve as an assistant to a registered dentist for a term which, with the period of his practice, would amount to five years.

Persons must within three months register their names with the board, and satisfy the board as to their practice and employment and good character. Persons wrongfully taking the name of dentist will be liable to a penalty not exceeding £20. The same maximum penalty has been fixed for persons other than legally qualified medical practitioners, or registered dentists, or practitioners under the authority of the act, who practice dentistry.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING NOVEMBER 1914.

November 3.

No. 1,115,678, to WILLIAM B. C. KAISER. Dental casting apparatus.

No. 1,115,702, to WILLIAM LUXMORE. Inhaling device.

No. 1,115,718, to WILLIAM H. MOSLEY. Adjustable instrument holder.

No. 1,115,779, to GEORGE BRUNTON. Dental flask and means for closing and fastening the parts thereof.

No. 1,116,056, to HENRI GRASSET. Fumigating apparatus for dental cavities.

No. 1,116,310, to NATHANIEL A. MASER. Sanitary dental tray.

November 10.

No. 1,116,371, to ERNEST C. BENNETT. Artificial denture.

No. 1,116,497, to FRIEDRICH SCHREIBER. Tooth bridge.

No. 1,116,720, to JAMES J. MCGUIRE. Dental casting machine.

No. 1,116,868, to ALEXANDER A. ANZELEWITZ. Saliva ejector.

November 17.

No. 1,117,275, to SAMUEL G. SUPPLEE. Dental impression tray.

No. 1,117,276, to SAMUEL G. SUPPLEE. Method for taking partial impressions for artificial dentures.

No. 1,117,660, to JOHN M. GILMORE. Dental disk moistener.

No. 1,117,701, to FRANK L. PLATT. Dental syringe.

No. 1,117,928, to WALTER J. THURMOND. Attachment for impression tray.

No. 46,650, to JAY LAVENSON. Design for tooth-brush.

November 24.

No. 1,118,156, to JOSEPH SCHOEPE. Method of making a tooth-brush.

No. 1,118,301, to THOMAS B. MAGILL. Process of filling teeth.

No. 1,118,703, to GEORGE W. TODD. Dental bridgework.

W. Storer How. Louis Jack. James Truman. Cyrus Newlin Peirce. Eri W. Haines.

"Golden Jubilee" Members of the Graduating Class of 1854 of the Philadelphia College of Dental Surgery

As they appeared at the time of the banquet held February 27, 1904, in honor of the fiftieth anniversary of their graduation.

THE

DENTAL COSMOS.

VOL. LVII. FEBRUARY 1915. No. 2.

ORIGINAL COMMUNICATIONS.

THE TEETH OF "EOANTHROPUS": THE PILTDOWN SKULL.

By ARTHUR S. UNDERWOOD, L.D.S.Eng., M.B.,B.S.Lond., L.R.C.P.,M.R.C.S.Eng.

THE interest of the Piltdown discovery, *Eoanthropus Dawsonii,* is more or less bound up with the deductions to be drawn from the mandibular teeth, two molars and a canine of the same side, which are the only dental remains exhumed so far.

The anatomy of the canine proves that the individual was prognathous to a greater extent than is the case in any other human remains, whether of recent or prehistoric races.

EVOLUTIONARY CHANGES OF BRAIN CAPACITY AND FACIAL PECULIARITIES.

This remarkable prognathism had already been suggested by the line of the lower margin of the mandibular fragment; the shape, size, and wear of the canine tooth had been accurately predicted, before the tooth itself was discovered, and when discovered it was found to conform entirely with the prediction in every detail.

If we allow Eoanthropus the lowest brain capacity which has yet been suggested (about 1100 cc.), this pronounced prognathism is truly remarkable. If the evolution of facial peculiarities proceeded side by side with and at the same pace as the evolution of the brain, the conjunction of such a braincase with such a face would present a state of affairs very difficult indeed to explain; but they do not proceed either side by side or at the same pace.

The evolutionary changes which transform the earliest form of brain into the extremely complicated cerebral apparatus possessed by modern man are not only incalculably slow, but they are also constantly progressing. There are no setbacks, no momentary changes dependent upon momentary changes of environment. I use the word "momentary" as applying to any space of time, whether long or short.

The evolutionary changes which have from time to time resulted in the facial peculiarities attending puberty in various primates are relatively capricious; they are not a process of continuous advancement, but from time to time record the ever-changing circumstances of environment. Thus we may find an animal whose ancestors comparatively recently possessed at puberty canine

teeth employed as weapons of sexual combat, developing under changed circumstances canine teeth with no such attributes at all. In short, while the brain evolution is a slow, steady, and continuous progress, the facial evolution is simply the reflection of the varying and evanescent circumstances of environment.

VARIOUS CONJECTURES AS TO THE TEETH OF THE PILTDOWN SKULL.

Although the mandibular fragment of the Piltdown skull and the teeth which were found in it, and particularly the sockets of the third molar (which was not found), tell a very plain tale to the student of odontology, it is by no means every anatomist who can read it.

One authority has actually suggested that the canine which was found might have been an upper tooth, although we all know that wear between upper and lower canines affects the posterior surface of the lower tooth and that the root of an upper canine of this type is not straight.

Another authority has thought that the third molar was not fully erupted, in defiance of the fact that the sockets are fully formed, and the alveolus dividing the anterior from the posterior roots rises a little higher than that belonging to the second molar.

A third author suggests that the canine was that of another individual, probably an ape, though the obvious signs in the fragment of what its canine ought to be like were sufficiently emphatic to enable me to make a model of the tooth a month before it was found by Père Teilhard. The canine ought never to have been mistaken for that of an ape; it differs from adult simian canines in many respects.

COMPARISON BETWEEN EARLY PLEISTOCENE CREATURES AND EXISTING ANIMALS.

In studying the relationship between creatures belonging to the dawn of the Pleistocene and existing animals, it is useful to bear in mind that the resemblances will be more easily observed if the specimen of the existing animal selected be a young female.

The differences which tend to mask underlying relationships become emphasized in the male animal at puberty. All the special armature which is acquired at this period by the male animal, such as excessively developed canine teeth, etc., tends to conceal the great racial affinities.

Thus the infants of homo, gorilla, chimpanzee, orang, and gibbon present great similarities, whereas the adult males differ profoundly, because of the special armature of puberty which they have acquired.

In comparing the mandible of Eoanthropus with that of a modern chimpanzee, a young female ape has been chosen for the foregoing reasons, although Eoanthropus is undoubtedly adult.

That the individual in question had attained full adult development is shown by two facts: The fully erupted condition of the third molars, which had escaped from the sockets after death, shows that the creature was at least adult; and the extreme degree of attrition of the masticating surfaces of the two existing molars, which are worn nearly flat and polished, shows that the creature had advanced beyond puberty.

DESCRIPTION OF FIRST LOWER MOLAR OF EOANTHROPUS.

The three teeth of Eoanthropus, two lower right molars and a lower right canine, I will now describe in detail:

The lower first molar is a five-cusped tooth, the cusps being worn down so far that the surface is almost flat. The indentations which represent all that remains of the pits between the cusps are very shallow and deeply stained, the color varying from the sepia tint to that of yellow ocher. (See Fig. 1.) The enamel covering, which is quite thin, is pure white. The radiograms taken by Dr. Archibald Reid, of 30 Welbeck st., show a fairly large pulp-stone in the

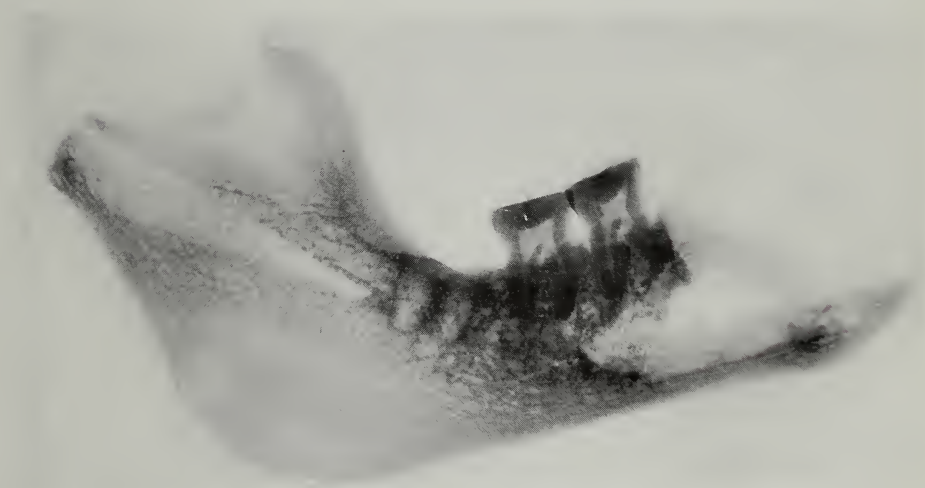
posterior cornu of the pulp chamber. (See Fig. 2.)

worn. The whole tooth is about 1/48 of an inch longer antero-posteriorly

Fig. 1.

Life-size reproduction of the upper surfaces of two lower molars of Eoanthropus.

Fig. 2.



Radiogram of mandible of Eoanthropus. (Taken by Dr. A. Reid.)

LOWER SECOND MOLAR.

The second molar has also five distinct cusps. Its surface is very similar to that of the first molar, but is less than the first molar, and about the same breadth, the pulp-chambers of both teeth are rather unusually large. There is nothing remarkable about the roots.

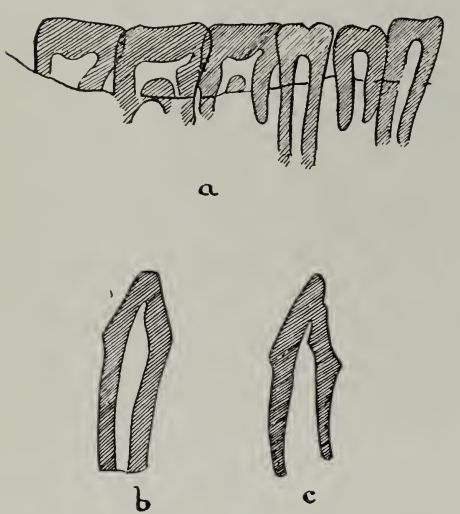
SOCKETS OF LOWER THIRD MOLAR.

The sockets of the third molar show that the tooth was fully erupted and had been in use for a long time. The backward direction of these roots is quite the common disposition of the roots of a modern lower third molar.

LOWER CANINE.

The canine tooth is 1 1/5 inches long. Its antero-posterior depth at the cingulum is 4/5 of an inch. There is a deep-worn facet on the posterior surface of the crown which is 4/5 of an inch in breadth as in length; this facet, caused by attrition against the upper canine during lateral movement of the mandible, is very deep. In the center of it there is an oval spot where the upper part of the pulp-chamber has been blocked up by secondary dentin.

FIG. 3.



Shaded reproductions of radiograms: *a*, Three lower molars, two bicuspids, and one canine of Homo Heidelbergensis. *b*, Canine of Eoanthropus. *c*, Incomplete canine of young female chimpanzee.

The apex of the root shows in the radiogram a very open apical foramen. It is possible, but by no means certain, that a tiny portion of the apex is missing. The apical foramina in the incisors of Homo Heidelbergensis are also very patent, as shown in Fig. 3.

The above description was written from the actual teeth, which Dr. Smith Woodward kindly allowed me to examine minutely with lenses and otherwise, while my wife was occupied in making the drawings.

PULP-STONE IN LOWER FIRST MOLAR.

The pulp-chamber is being filled up at the top with secondary dentin, while the beautiful radiograms (taken by Dr. Archibald Reid) show that this renewed activity of the odontoblasts, incidental to age and wear, has resulted in the formation of a large pulp-stone in the pulp-chamber of the first molar.

It may be as well to recall to readers the fact that the ondontoblast cells, having finished forming the dentin, rest inactive for a considerable period of years, but that when either attrition or caries in later life approaches the pulp, the old odontoblasts commence to be active a second time. They form dentin, called secondary dentin, in any situation where an exposure is threatened.

Their work at first is imperfect, just as the work of old soldiers called to the colors after a lapse of years is at first by no means perfection; afterward the cells seem to fall into their old habits and make pretty fair dentin. This imperfection is evidenced by the formation of islands or peninsulas of roughly made dentin; and from the presence of such an island in the pulp-chamber of Eoanthropus, it is fair to infer that the individual was advancing in middle age.

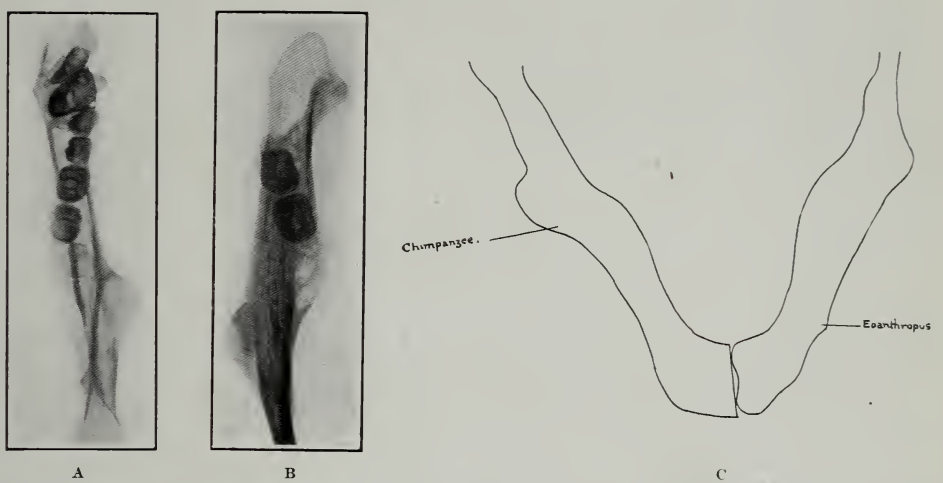
ATTRITION AS A FACTOR IN THE INTERPRETATION OF THE PILTDOWN FRAGMENT.

The fact that the molars have been worn fairly flat and very smooth has been used as an argument against the possibility of their coexisting with a raised canine. As a matter of fact, most animals with raised canines, or for the matter of that, raised incisors, do by

lateral or antero-posterior movement wear their cheek teeth approximately flat. Purely carnivorous animals do not do so, but wherever there is lateral movement of the mandible or the maxilla, however large canine teeth the animal may possess, the mutually opposing surfaces of the upper and lower canines—that is the anterior surface of the upper canine and the posterior surface of the lower canine—are worn into flat polished facets, and this is due to pattern on the worn surface. In all these cases the canines and incisors are also mutually attrided. Whether the resulting molar surface is *quite* smooth or not depends not on the amount of lateral movement, but on the arrangement and thickness of the plates of enamel.

An elephant or a horse has the worn surfaces kept rough, because of the thickness of the enamel ridges and the different power of resistance to attrition

FIG. 4.



A, Radiogram of half the mandible of young female chimpanzee, from above. (A. Reid.) B, Radiogram of fragment of the mandible of Eoanthropus, from above. (A. Reid.) C, Outline drawing from radiograms of half mandible of Eoanthropus and half mandible of young female chimpanzee placed as though articulated at the symphysis.

this very lateral movement, and to nothing else.

In felidæ, where there is practically no lateral movement and the temporo-maxillary joint is a simple hinge (the external pterygoid muscle not even being attached to the interarticular fibro-cartilage), though the canines are immense, they are not worn by mutual attrition, neither are the cheek teeth worn flat.

But in the ape, bear, hippopotamus, capybara (hydrochœrus) and histrix, etc., the cheek teeth are always worn down to a degree of flatness, sometimes with ridges of enamel making a raised of the more calcified and less calcified tissues. The amount of lateral movement is not the all-important factor.

I have spent some time on several occasions in a friendly meal with a young orang and two adult chimpanzees (male and female), and, although they all had well-developed canines, their principal movement in mastication was produced by alternate contraction of the external pterygoids. All these animals had relatively larger canines than Eoanthropus.

I have said more than once that I was so certain, from the consideration of the mandibular fragment of Eoanthropus, of what must necessarily have

been the shape of the missing canine, that I ventured to make a drawing and model of it a month before the actual tooth was found. I should like to state exactly the grounds for this certainty.

COMPARISON BETWEEN EOANTHROPUS AND SIMIANS.

Looking at the fragment from below as shown in the outline drawing, traced from a radiogram (see Fig. 4, A, B, C), it is plain that the under part of the mandible in the region of the six front teeth, and especially in the middle line, was as wide antero-posteriorly as that of a young chimpanzee. In the drawing I have shown the fragment and the half mandible of the chimpanzee placed as if articulated in the middle line.

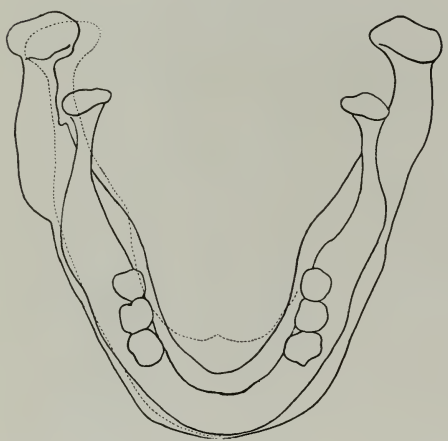
It is plain that the degree of prognathism is not very different in the two animals; if a similar drawing of any other prehistoric mandible, such as that of Homo Heidelbergensis, be similarly placed beside the drawing of the fragment (see Fig. 5), it will be seen that the symphysis in Homo Heidelbergensis is not nearly so produced antero-posteriorly; this is still more obvious in the case of modern man. Looking at a tracing of a lateral view of a section at the symphysis of the fragment as compared with that of the chimpanzee (see Fig. 6), the similarity of curve is again apparent, and the absence of chin is much more pronounced and more simian in type than that of any other prehistoric human mandible.

Fig. 2 shows another point which has not up to the time of writing been alluded to, but which went far to assure me of the type of canine which would be found should the excavators be fortunate enough to find one.

The conformation of the bones supporting the teeth is profoundly modified by the form and uses of the teeth themselves, but especially is this the case when the canines are greatly developed. In adult apes the lower line of the mandible seen in profile descends to form a little lump or prominence just underneath the apex of the canine root.

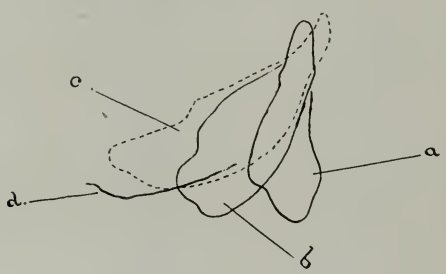
There is no such lump in the lower outline of modern man nor in that of Neanderthal mandibles, but it is quite plain in the fragment of Eoanthropus. If the reader will take the trouble to observe carefully a large series of mandibles of various animals, he will readily be convinced that this buttress of bone always exists where a massive root approaches the lower surface. In modern man, the apex of the root of the lower canine does not approach very near the

Fig. 5.



Outlines of three mandibles: 1, Homo Heidelbergensis (lowest outline). 2, Modern man (superimposed). 3, Fragment of Eoanthropus (dotted outline).

Fig. 6.



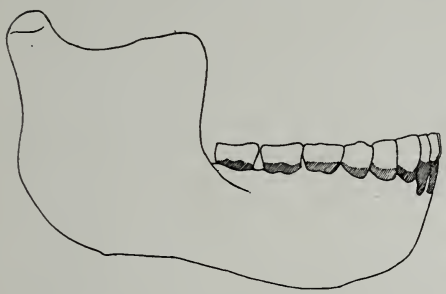
Sections in outline, at the symphysis, of mandibles of—*a*, Modern man. *b*, Homo Heidelbergensis. *c*, Gorilla. *d*, Eoanthropus.

lower margin of the mandible, and therefore such a buttressing of the bone would be quite uncalled-for. The same may be said of Homo Heidelbergensis or any other Neanderthal mandible. (See Fig. 7.)

There are various other simian characters in the mandibular fragment which may be noticed, if we look at Figs. 2 and 8. The shape of the coronoid process and the sigmoid notch are remarkably similar, if we make allowance for the fact that the ape is a young individual, not having erupted the third molar or worn down the other molars to any appreciable extent, while Eoanthropus was well on in middle age.

In this young ape, the backward development of the part of the mandible behind the teeth has not been completed, so that the coronoid process and the condyle are relatively farther forward than they would have been had the specimen been of adult age. The position of the mylo-hyoid groove behind and below the inferior dental foramen, instead of running right over it at the same level, is also a typically simian feature.

Fig. 7.



Side view of mandible of Homo Heidelbergensis.

CONCLUSIVE IDENTIFICATION OF LOWER CANINE.

It may be as well to notice the suggestion that the canine tooth which was found might have belonged to the upper jaw. It is difficult to understand why this suggestion was made; but having been made, it cannot be passed over.

Fig. 8.

Radiogram of half the mandible of young female chimpanzee. (A. Reid.)

The tooth found is extensively worn on the posterior surface only. This should dispose of the suggestion at once, but if that is not enough to decide the matter, the fact that the root is quite straight should do so. Had it been in the upper jaw of such a prognathous animal, the root would, of course, have been gradually curved backward, following the line of the maxillary surface; half an hour in any museum devoted to comparative anatomy ought to satisfy any careful observer of this fact.

TUBE TEETH AND PORCELAIN RODS: THEIR USES AND ADAPTATIONS IN PROSTHETIC DENTISTRY.

By JOHN GIRDWOOD, D.D.S.Univ.Pa., L.D.S.Edin., Edinburgh, Scotland.

(Continued from page 57.)

(X.)

CHAPTER XIII.—A Suggested Revival of Gum Tube Teeth and Sections, Especially in Connection with Modern Methods of Casting.

In bringing forward suggestions regarding a revival of the manufacture and use of gum teeth and sections, the statement was made that one of the objects in hastening the publication of these papers was to endeavor to stay the production of the ever-increasing number of new tooth forms. It was also intimated that such suggestions as would follow—with the exception of those dealing with porcelain tube rods—would have reference to the revival of tooth forms which, owing to a variety of causes, some of which have been already given, were never as fully presented as their outstanding merits demanded.

While the writer cannot hope to do full justice to the subject, he hopes that the claims which will presently be set forth may arouse a real and lasting interest on the part of the profession, when no doubt the makers of artificial teeth will show a practical interest and set about supplying the demand which he trusts will arise.

Various forms of gum tube teeth and sections were manufactured on a commercial basis at an early date—about 1846 by Messrs. Lemale and Messrs. Ash of London—and had their origin in the carved blocks of about eighty years ago. These gum tube teeth and sections were largely used prior to the introduction of vulcanite about 1858, and were then employed with decreasing frequency, while for many years their use had been entirely discontinued.

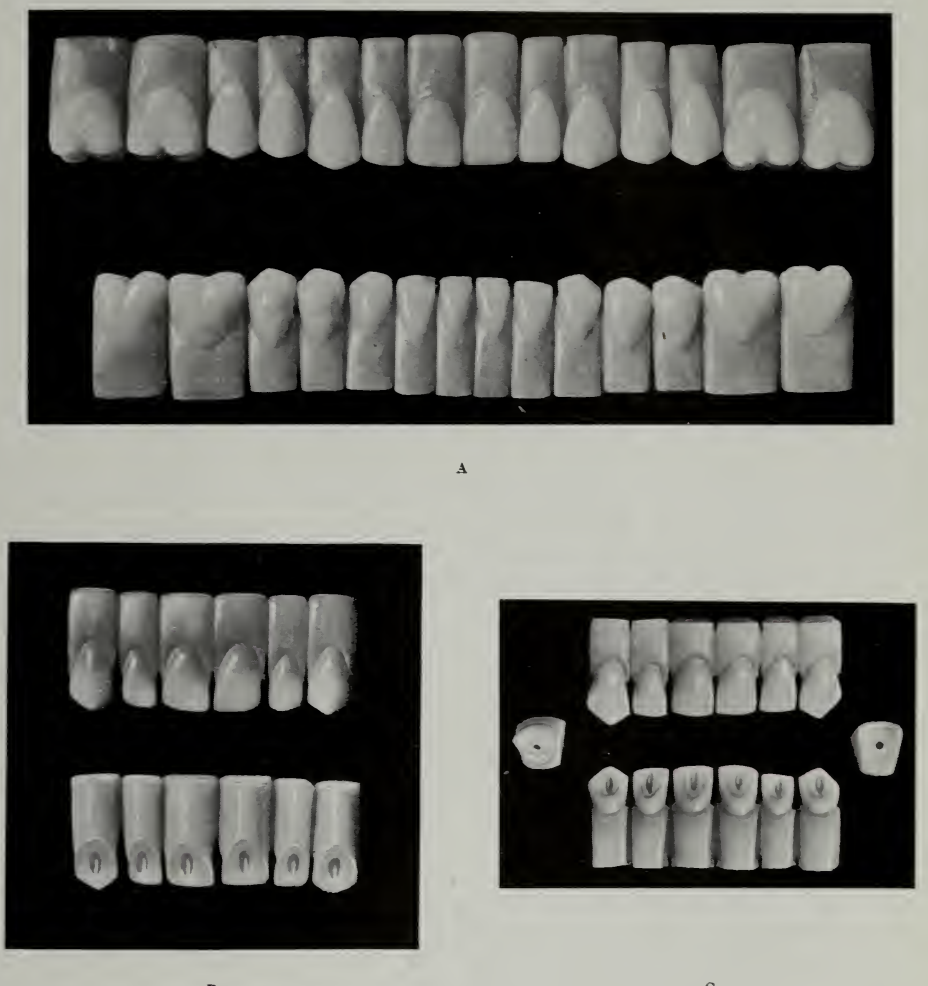
There is no evidence to show that gum tube teeth and sections were ever manufactured in America on a commercial basis, but about 1856 both gum teeth and sections—for use in connection with the Blandy Process—were manufactured by the S. S. White Co. (see S. S. White's Tooth Catalog pages 17 and 158), and were soon followed by gum teeth and sections with platinum pins for use in connection with a vulcanite base, and these latter have been largely used up to the present time. Those for use in plate work were doubtless introduced at an earlier date; at all events they were manufactured in England before 1850. It is surprising that the single gum pin teeth and sections for use in vulcanite work should have succeeded in displacing the pinless forms, as they are in no way superior, and it is not surprising that pinless forms of teeth should now be displacing those with platinum pins, although the latter are inferior in all respects to their prototype, the original pinless forms.

Had it been realized at the time when gum teeth and sections with platinum pins for use in vulcanite were introduced —about 1858—that platinum would ever reach its present price, and that pinless forms would prove as adaptable in every

way, it is safe to affirm that these gum teeth and sections with platinum pins would never have been introduced. An even greater mistake, however, was made in failing to recognize the superiority of contributed to prevent men from considering the possibilities in this connection.

Attention will now be directed to the advantages which would be derived by

FIG. 167.



A

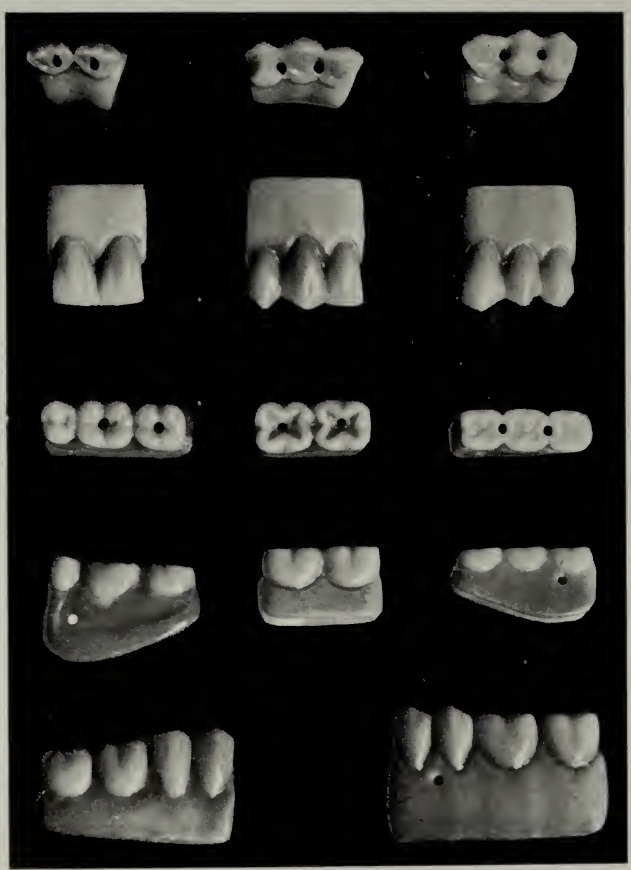
B C

Some old forms of single gum tube teeth.

gum tube teeth and sections for use in vulcanite, as well as plate work. Doubtless this arose from failure to recognize the possibility of employing them in this way, while the obstacles presented by the lack of suitable appliances for grinding the adoption of gum tube teeth and sections in place of the forms of platinum pin and pinless teeth at present in use. The outstanding point with regard to the superiority of the former is their suitability for use in connection with

Fig. 168.

A



B

Old forms of gum tube teeth and sections. Note the provision of swivel bolt for spiral springs in some of the bicuspid and molar sections.

the casting process. In this respect they hold a unique place, as none of the other forms are adapted for use in this way, but in addition to this, they are also

Fig. 169.

Showing the amount of overbite to be obtained even without grinding.

suitable for use in all cases where other forms of gum teeth are employed, yielding better results in most, while under no circumstances are they inferior. The claims advanced in favor of tube teeth are applicable also in connection with those sections, and at the risk of being accused of too frequent reiteration, a few of them may be repeated.

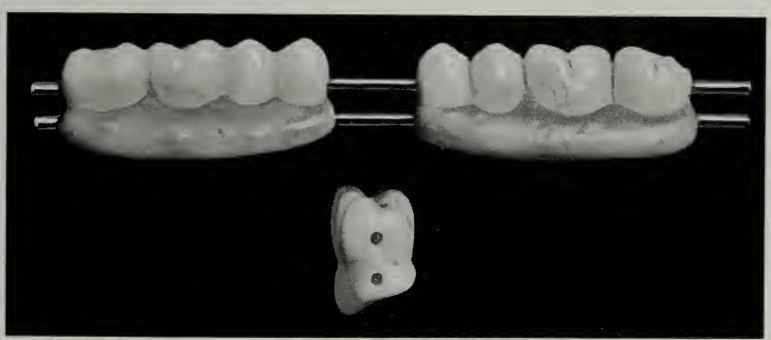
Their adaptability has already been spoken of in conjunction with the casting process, and will be described later on, as will also the use of tube teeth and single gum tube teeth in this way. Figs. 167 and 168 will show a few of these old forms of single gum tube teeth and sections. The advantages spoken of were strength, easiness of repair, security of anchorage, natural appearance, and comfort.

Strength. With regard to strength, this is apparent from the bulk of porcelain, which is disposed to greatest advantage for this purpose.

Easiness of repair. In the event of fracture, or from any other cause which may necessitate replacement, a new tooth or block can be substituted much more quickly than by either vulcanizing or soldering. In consequence, the risks associated with these methods are eliminated.

Anchorage. The subject of anchorage is one of great importance, and it will be observed that ample provision is made for this in connection with gum tube sections as well as single gum tube teeth when either the old method of grinding and fitting or the casting process is em

Fig. 170.



Gum section blocks shaped-up from rod No. 28. Time for shaping-up, about four and a half hours—not including time for fusing gum enamel.

ployed, while the same applies to their use in vulcanite work. But it may be worth while to point out once more that gum tube teeth and sections permit of greater adaptability in cases of abnormal overbite than do pin gum teeth and

sections, in dealing with which attempts to obtain additional overbite are made

The bridge worker will at once realize the possibility in connection with these

Fig. 171.

A B

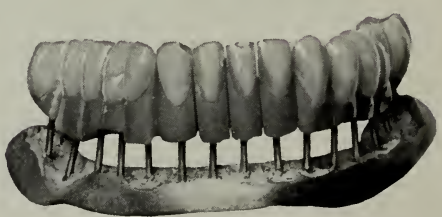
A, Cast metal plate with gum sections. B, With blocks raised to show attachments.

Fig. 172.

Single gum front teeth, and molar and bicuspid section.

Fig. 173.

Fig. 174.



at the expense of the anchorage (Fig. 169.)

teeth and sections, the use of which would fill a gap at present imperfectly

occupied by fused gum body. The provision for anchorage, however, as will be seen from the illustrations, is confined to vertical tubes, and while these afford ample anchorage for fixed and removable saddle bridges, an additional horizontal tube or tubes would be advantageous (Fig. 170). This might be introduced without interfering with their employment in other ways.

Other advantages which would result from the use of these teeth are derived from the smooth wall of porcelain in the lingual surface, and the increased amount of room which is available for the tongue resulting from the disposition and nature of the anchorage.*

The application of these sections in plate work is similar to that described in connection with single tube teeth, or two or more teeth shaped-up from porcelain rods, and one of the objections which resulted in the displacement of tube teeth by the platinum pin variety was the time spent in grinding and fiting; but this objection no longer holds good, because of improved methods and appliances. If these teeth and sections were now available, they would doubtless be extensively used because of their suitability for use in the various classes of work spoken of.

It is, however, in connection with the casting process in plate work that the writer sees the greatest scope for their use, and the reasons for this, apart from those already given, may well be borrowed from the claims advanced in favor of continuous gum work. (See Figs. 171 and 172.) These are chiefly greater artistic freedom and hygiene. With reference to the former, it is true that greater scope is provided for obtaining any desired position for individual teeth than is possible with manufactured sections, but the bulk of porcelain and the ease with which it can be shaped up and afterward polished, render tube sections far superior to the ordinary kind, while admittedly inferior to continuous-gum work. On hygienic grounds the claims advanced are as sound for tube sections as for continuous-gum or any other forms of teeth.

It appears, then, that the possibility of adjusting individual teeth is the only point where continuous-gum work obtains an advantage over tube sections, while the corresponding advantage which they possess over all other forms will be apparent.

THE USE OF TUBE TEETH, GUM TUBE TEETH, AND SECTIONS IN CONNECTION WITH THE CASTING PROCESS.

After the model and bite have been obtained, the necessary steps with regard to the employment of gum tube teeth and sections in connection with cast plates are as follows: A wax base-plate is made in the ordinary way, and the base of the tube teeth or gum sections should be rough-fitted to the model, and their sharp edges neatly rounded off—they should also be fitted to suit the bite, and the joints accurately adapted in the ordinary way. (See Figs. 173 and 174.) The tubes are next to be hollowed out a little at their bases, in order to permit of an extra thickness of gold for the purpose of increasing the anchorage of the pins. The teeth should now be slightly oiled, in order to prevent them from sticking to the wax, when they should be gently pressed into it, and any deficiencies with regard to fit made good by careful waxing up. The pins may be of dental alloy or gold, the former for choice, as it gives a stronger union. The pins are next to be warmed, and all in turns placed in their respective tubes and pressed through the wax until they touch the model. Having chilled the sections and wax with water, they should be removed carefully, so as not to alter the position of the pins; any superfluous wax may now be removed, the teeth or sections once more tried, in order to make certain of their

* The writer is fortunate in possessing a large stock of the various forms of gum teeth and sections, most of which were made from thirty to seventy years ago, also some much older specimens. Most of these, some of which are illustrated in this paper, he owes to the kindness of Messrs. Lemale & Sons of London.

position, then removed, when the investment and casting should be carried out in the ordinary way. In order to add to the anchorage of the pins to the plate, a slight groove may be formed around the base of each, or a very slight amount of solder sweated on to the end.

After the plate has been cast, and before proceeding to finish it, the teeth or sections should be stuck on temporarily with hard wax, in order to obtain the best finish and prevent damage to the pins during the finishing process.

From the foregoing, then, it will be seen that a case in which gum tube teeth or sections are used may be as easily and quickly made as a vulcanite plate, and the description given is applicable to tube teeth as well as gum tube teeth and sections.

The question of weight is not one which is likely to cause difficulty, as cast plates with tube teeth or gum sections need be no heavier than ordinary plate work, and far lighter than continuous-gum work. There is also the choice of aluminum and certain alloys.

(To be continued.)

THE CEMENT LUTE IN INLAY WORK.

By J. B. PARFITT, L.R.C.P., M.R.C.S., L.D.S.Eng., Reading, Eng.

(Report presented to Section III, Sixth International Dental Congress, London, 1914.)

IT would be difficult to overrate the importance of the cement which fixes an inlay into its containing cavity, for if the cement gives way the most perfect inlay ever made will be a failure, whereas if the inlay should get broken, or even come out, the tooth will at least be preserved from decay as long as the cement lining remains intact.

With a considerable degree of truth an inlay may be defined as a cement filling of which the exposed part is to a great extent, although not entirely, protected by a layer of porcelain or metal, and a discussion of the cement lute practically resolves itself into an inquiry as to how far such a composite filling possesses the advantages and avoids the disadvantages of one composed of cement alone.

It may be stated at once that inlays have most of the advantages of cement, such as freedom from secular change, and from irritation or staining of the tooth substance.

This statement requires perhaps a little qualification or explanation. Laboratory experiments have very certainly shown that, after setting, cement undergoes changes, both in its internal structure and in bulk. Experience seems to show that, under ordinary conditions, change in bulk must be quite small, many old cement fillings on removal proving to have a join so close that there seems to be almost an actual adhesion to the dentin; moreover the particular disposition of the cement when it forms the lute of an inlay renders a slight change in bulk of comparatively little importance; even if there were a very large contraction, of the order of 1 per cent. linear, the effect on a cement margin 50 microns broad would be to open a chink only 0.5 micron broad, and in all probability the utmost we could expect would fall far short of this amount. With regard to absence of irritation, metal inlays will of course conduct heat to the pulp less or more in proportion to the thickness of the cement that lies between.

The important advantage of facility of manipulation cannot be claimed for inlays at all.

DISADVANTAGES OF CEMENT.

I will now pass on to the disadvantages of cement. Of these the only one that calls for discussion is its lack of permanence, cement fillings suffering both from mechanical wear and from chemical solution. Incidentally, this loss of substance frequently leads to the formation of a rough surface, and consequent mischief from lodgment of food.

Mechanical wear, that is the loss of substance by abrasion, is in inlay work prevented by the peculiar disposition of the materials which form the composite filling, as the hard layer of the inlay itself, whether it be metal or porcelain, protects the underlying and relatively softer cement from the stress of mechanical wear; the grave hygienic disadvantage of a rough surface is also avoided, one of the most valuable properties of inlays being that they can be made to take and permanently retain a high polish.

The question of chemical solution of the cement lute is one that will demand more detailed consideration than that of mechanical wear, as it is by no means so evident that the layer of inlay material will in this case afford adequate protection to the cement from the fluids in the mouth capable of dissolving it. If the fit of an inlay were perfect, as perfect for instance as the fit of a well-made glass bottle stopper, and if such an inlay could be accurately cemented into its place we should have perfect and permanent protection of the cement lute, in fact we should have a filling which would be everlasting, subject only to undermining by fresh caries, or the incidence of an overwhelming force. Unfortunately this ideal seems impossible of attainment; perhaps the nearest approach that can be made to it without much difficulty is by the use of the Dall method of grinding both cavity and inlay material to a form with a circular cross-section, the inlay itself being a truncated cone of small taper. In actual practice the protection of the cement is never absolute, there is always some area of it exposed, and unfortunately the dissolving fluids can penetrate into chinks and around corners and reach places that are quite immune from the attacks of mechanical agencies; in fact it may be that in some cases they act all the more quickly if they are not subjected to too much disturbance.

From the time when inlays were first introduced, the solution of the cement has always been the point as to which inlay workers have had doubts and fears, and, on the principle of a chain being no stronger than its weakest link, many have no doubt felt that an inlay would last no longer than a plain cement filling; experience, however, has shown that inlays have a very good record for lasting properties, and that in actual fact the cement is protected from solution to a very considerable degree.

In discussing the amount of protection from solution which its peculiar distribution gives to the cement, two questions call for consideration, namely, the factors that determine the thickness of the cement layer, and the influence which this particular manner of distribution had on the rate of solution.

THICKNESS OF THE "CEMENT LINE."

The factors which influence the thickness of the "cement line" are—

(1) The amount of discrepancy (if any) between the dimensions of the cavity and the inlay.

(2) The shape of the cavity in sections vertical to the floor.

(3) The size of the grains of cement.

(4) The consistence to which the cement is mixed and the amount of pressure used in forcing the inlay into its place.

(1) The discrepancy between the sizes of the cavity and the inlay will vary in different cases according to the material and method made use of.

Porcelain inlays made by the usual method of swaging a foil matrix into

the cavity or some reproduction of it must of necessity be smaller than the cavity to the extent of the thickness of the matrix. A useful and frequently employed thickness of foil is one-thousandth of an inch, or 25 microns, and this would be the width of the chink surrounding the inlay, and consequently the thickness of the "cement line."

In the method invented by and named after Dr. Peck, the thickness of the foil matrix does not come into the problem at all, as it is made on the counter, reverse, or, to use a photographic analogy, a negative of the cavity, and thus is itself an exact-size model thereof in its internal dimensions. In practice it is possible, with care, to make inlays that will go into the cavity with almost what engineers would call a "driving fit."

Of the methods in use for making gold inlays, that of the "Alexander plastic gold" probably yields an inlay the size of which is very near indeed to that of the cavity. Theoretically this should be the case, because the gold is actually molded into the cavity and is never melted in all the subsequent operations. This conclusion is borne out by experience, as it is quite possible to make inlays by the Alexander method with margins sufficiently good to bear inspection under a magnification of eight or ten diameters.

A somewhat similar result, both theoretically and practically, is arrived at by the "reinforced matrix" method, which consists in casting into a platinum matrix in two stages, the matrix, with its cast "core," being reburnished to the cavity margins before the second casting which completes the contour.

The ordinary or "lost wax" process generally yields an inlay which is too small for the containing cavity. It is not an easy matter to give a definite estimate of this contraction, because it is a sum of several different amounts, due to different causes which fortunately to some extent neutralize each other.

The causes of the discrepancy between the size of a cast inlay and its cavity are—

(*a*) The contraction of the wax pattern in cooling from mouth temperature to that of the investment. Some figures given by Van Horn* show that this is about of the order of 0.0002 for each degree C.

(*b*) Expansion of the investment on setting. This may be taken to be much the same as that of plaster, and in the case we are considering would probably be negligible; any influence it would have would be in the direction of lessening the total contraction of the inlay.

(*c*) Expansion of the investment in heating from room temperature to that of casting. This seems to be quite large in amount, Van Horn finding that there was a difference of about 1 per cent. linear between a block cast in a red-hot mold and one cast in a cold one.

(*d*) Contraction of the gold in cooling from its molten state to body temperature. The coefficient of expansion of gold is given as 0.000015 per degree C. between 0° and 100°, so that the total contraction would probably be 2 per cent. or more.

The sum of all these separate discrepancies almost always results in a certain amount of contraction, varying according to the manipulation employed; in some cases it may be as much as 1 per cent. linear, or even more.

(2) The shape of the cavity is of considerable importance in this connection, because in some cases a discrepancy at the margin can be lessened or removed altogether by the inlay sinking slightly into the cavity. The extent to which this diminution of the marginal chink can be carried depends on the amount of the departure of the cavity walls from the perpendicular. If the containing walls are perpendicular to the cavity floor; that is, if they are parallel to one another, it is obvious that no amount of sinking-in of the inlay toward the floor will diminish the marginal chink at all. In any actual case the distance the inlay will have to sink into the cavity in order to bring its edge

* "The Wax Pattern: A Technique," etc., by C. S. Van Horn, D.D.S., DENTAL COSMOS, 1912, vol. liv, p. 973.

into apposition with the enamel margin will be the width of the marginal chink multiplied by the cosecant of half the angle at which the opposite sides of the cavity are inclined to one another; thus, if the marginal chink is 20 microns broad and the opposite sides of the cavity are inclined at a right angle to one another, that is if they are each inclined 45° away from the vertical, a sinking of the inlay 28 microns into the cavity will bring it into complete apposition with the cavity wall. In the case of parallel walls cosec. 0° is infinity, which corresponds with the statement made above, namely, that in this case *no amount* of sinking-in of the inlay will make any difference to the marginal chink. The other extreme case would be the apposition of two flat surfaces, such as might occur in the fitting of a tip to a front tooth; here the opposite walls of the cavity may be considered to be in the same straight line, or to have an inclination of 180° to one another; half 180° is 90°, and cosec. 90° is 1, which corresponds to the fact that here a theoretically perfect joint is obtained by the inlay settling nearer to the tooth by an amount equal to the thickness of the foil matrix used.

These considerations justify us in concluding that with correct cavity preparation and choice of a suitable method we should theoretically be able to make an inlay whose margins are in perfect apposition. We have, however, still to reckon with the cement itself.

(3) The actual size of the grains of the cement is a matter of the greatest importance, as it is certain that many of them retain their individuality after mixing.

Valuable papers have been published, notably by Head* and Poundstone,† on the problems of the inlay cement line.

It appears that in the ordinary cements we must expect grains 25 microns thick or even larger, so that it is better to use a cement ground specially fine. We shall probably not be very far wrong if we assume that the size of the cement grains will prevent the reduction of the joint much below 25 microns.

(4) The amount of pressure used in setting the inlay will naturally influence the thickness of the cement margin to some extent. Some experiments made by Head showed that with a block ¼ in. square, eight pounds pressure with a certain cement gave a film $\frac{15}{10{,}000}$ in. or about 37 microns; an increase of the pressure to one hundred pounds caused a reduction of the thickness of the film to about 22 microns; with another cement a similar increase of the pressure caused a reduction of the thickness from 25 to 15 microns.

A hundred pounds might seem a very great pressure, but we must remember that it was distributed over the area of a ¼ in. square, and that what counts in these matters is not the total pressure but the amount of pressure per unit area. If the floor of the cavity were deepened so that the pressure fell on the margin alone, its intensity in the narrow band around the edge of the inlay might well equal or even exceed that used in Head's investigations. It should be mentioned that Head obtained films as thin as 7 microns, using specially ground cement powder and a pressure of only eight pounds to the ¼ in. square.

It is this peculiar disposition in a thin layer presenting only its edge to the solvent action of the saliva that explains the relative permanence of the cement forming the lute of an inlay.

INFLUENCE OF DISTRIBUTION OF CEMENT UPON ITS RATE OF SOLUTION.

Other things being equal, the rate of solution of a substance will depend on the area of it exposed to the action of the solvent and the rapidity with which the saturated solution can be removed so that a fresh portion of solvent can be brought into action.

In this particular case the area ex-

* "Tests on the Inlay Cement Problem," by J. Head, D.D.S., DENTAL COSMOS, 1905, vol. xlvii, p. 779.

† "The Cement Problem in Inlay Work," by G. W. Poundstone, D.D.S., DENTAL COSMOS, 1905, vol. xlvii, p. 756.

posed is small, nevertheless solution will no doubt go on at first as rapidly as with a plain cement filling in the same mouth. In a short while the exposed edge of the cement will come to lie at the bottom of a narrow and relatively deep chink in which the saturated solution will tend to stagnate, especially as the chink will get more or less choked up with all sorts of insoluble débris. In most cases solution will go on with less and less rapidity, and in many will after a time practically come to a standstill altogether; in any particular case the rate will depend on several different factors, such as the chemical and physical characters of the cement, the composition of the patient's saliva, and the position of the joint in relation to the bite. In this connection it is, I think, a well-established and remarkable fact that although the cement does wash out to some depth, the tooth very frequently remains free from fresh attacks of caries.

The rate of solution may possibly be affected by the nature of the material forming the inlay. Thus it is conceivable that a gold inlay, owing to its relatively large conductivity and coefficient of expansion for heat, might be subject to frequent small changes in bulk, and so tend to help the renewal of solvent in the joint: there may also, under some circumstances, be a slight amount of electrolytic action going on at the surface of a metal inlay.

INFLUENCE OF CEMENT ON SHADING OF INLAY.

The influence of a layer of opaque cement on the appearance of a porcelain inlay deserves perhaps a brief consideration.

Both porcelain and tooth substance are translucent materials, and, as with all other bodies, their "shade" will depend both on their own nature and on the illumination they receive; moreover, the light they send to our eyes comes not only, nor in this case even mainly, from the surface, but also from layers which lie deeper down, and in their passage through the porcelain or tooth substance the light rays are broken up and reflected many times.

Under ordinary circumstances the "lighting" of the teeth is from above downward and backward, and the apparent shade varies considerably with the raising or lowering of the upper lip. If, now, a central tooth has its tip restored with porcelain, and an opaque line, although thin, and it may be quite invisible, runs horizontally across it, the relative shades of tooth substance and porcelain will alter with every alteration in the level of the upper lip. The reason of this is that the opaque layer prevents the basal part of the tooth from receiving any light from the occlusal part, so that each gives back just the light it receives from the outside source, and while the porcelain tip remains constantly much the same "shade," the base looks light or dark according to the position of the lip. If instead of a transverse layer there is a vertical one running from before backward, the raising or lowering of the lip will affect both halves of the tooth in the same way, hence a porcelain restoration with a vertical join can be so matched that it looks well in all conditions of lighting, whereas one with a horizontal join will only be at its best if one particular set of conditions is realized, and especially with one particular position of the upper lip.

The same principles govern the lighting of porcelain inlays in other positions; in the case of interstitial cavities in canine teeth for instance, except that the conditions of illumination are not so changeable, the front part, whether it be porcelain or tooth substance, tends always to throw the back part into shadow, so that mesial inlays have to be made darker and distal ones lighter than the original color of the tooth.

CONCLUSIONS.

(1) The cement lute confers on inlays all the advantages of cement except facility of manipulation.

(2) The thickness of the film at the edge can by suitable choice of method be theoretically reduced to the size of the grains of cement.

(3) Such a film is in most cases practically immune from solution and altogether immune from mechanical wear.

(4) With an opaque cement the character of the lighting of a porcelain inlay depends on the direction of the plane of the join.

THE PATHOLOGY OF THE DENTAL PULP.

By RUSSELL W. BUNTING, D.D.Sc., Ann Arbor, Mich.

(Report presented to Section II, Sixth International Dental Congress, London, 1914.)

AS we review the contributions to the pathology of the pulp we find that relatively less is known of the morbid anatomy of that organ than of any other component of the tooth, save perhaps the pericementum. In fact, those who have made a special study of the subject admit that they do not fully understand the normal structure and histological complex of the pulp, so that they often find it difficult to determine the degree of variance of a pathological condition from a histological norm. This is due in large measure to the fact that they have met with great difficulty in perfecting a technique by which they may prepare the pulp for microscopical study with a minimum amount of change. Incased as it is in the hard dentin wall, with which it has an intimate relation, the pulp offers numerous obstacles in the process of fixation and sectioning.

Students of the subject have met with a second difficulty when they have attempted to link the various pathological conditions of the pulp with the symptoms which accompany them. It is true that few tissues of the body offer equal opportunities for antemortem examination, it being possible to catch the pulp in any stage of inflammation or degeneration, but the symptomology of this organ is so obscure that great difficulty has been experienced in synchronizing the symptoms with the pathological conditions which produce them.

STUDIES ON THE MORBID HISTOLOGY OF THE PULP.

But in spite of the many difficulties much valuable work has been done upon the pulp, and many beautiful preparations have been made which faithfully depict the morbid histology of that organ. The most comprehensive and complete contribution which has been made in America is that given by Dr. G. V. Black in vol. i of the "American System of Dentistry," by Litch. The text of this treatise, with the illustrations which accompany it, has formed the basis for many other works upon the subject which have appeared since the time of its publication.

Dr. Black, in the treatment of this subject, first describes the histology of the pulp, and dwells at some length upon its sensory functions. As to its symptomology, he speaks of the pulp as being a true internal organ, having no tactile sense. He goes on to say that it has a "resentment to heat and cold which is a special sense of the dental pulp; under normal conditions it has none other whatever." He reviews the symptomology with regard to the sensory functions, and cites cases illustrative of referred pain of dental origin.

He speaks of the physical conditions which surround the pulp, which in times of hyperemic disturbances prevent swelling, and are a restraint to edema and the migration of the leucocytes from the

bloodvessels to the surrounding tissues. He states that he has not found secondary inflammation and swelling of the periapical space as a result of hyperemia and inflammatory conditions of the pulp, but that they occurred only when the pulp was badly affected or nearly disorganized.

HYPEREMIA.

Among the various pulp diseases, hyperemia is first considered. In his presentation of this subject Dr. Black reviews in detail the methods of his observations, and the technique by which he prepared his specimens for study. He gives many illustrations of pulps in the various stages of disease, and detailed descriptions of the conditions found, by which the reader is led through the phases of hyperemia, thrombosis, and inflammatory conditions of the pulp. He further says that all pulps which are exposed to the action of the saliva are inflamed, but that inflammation seldom occurs when there is no exposure. As to the sequelæ or prognosis of such inflammation, he says, "The dental pulp has a considerable power of recuperation from the inflammatory state. It is certain that moderate extravasations of blood are disposed of successfully, and that a considerable bulk, considering the size of the organ, of inflammatory lymph is tolerated without destroying it, and would undoubtedly be disposed of by the tissues if the case were placed under favorable conditions. . . . Of the ability of the dental pulp, when placed in good hygienic conditions, to recover from inflammation there can be no doubt whatever."

The author then considers the Infections, with special reference to ulcerations and abscesses of the pulp. He has found that abscesses are far more common in the multi-rooted teeth than in those having a single root.

CHRONIC PULP DISEASES.

Of the chronic diseases, hypertrophy is first described, and cases are cited in which the hypertrophy was accompanied by absorption of the dentin. Under Degenerations the deposition of calcoglobulin in disease conditions and the formation of pulp-stones is reviewed. The hard formations within the chamber are described as follows:

(1) Secondary dentin.
(2) Dentinal tumors in the pulp chamber.
(3) Nodular calcifications among, but not of, the tissues of the pulp.
(4) Interstitial calcifications of the tissues of the pulp.
(5) Cylindrical calcifications of the pulp.
(6) Osteodentin.

The author makes the statement that very frequently slight chronic affections of the pulp will cause the destruction of a portion of the layer of odontoblasts. In case a secondary deposit of dentin is formed in this region, it is devoid of tubuli or dentinal fibrillæ. Also, that under certain conditions these odontoblasts which have been lost may be regenerated.

In his conclusion Dr. Black says that all secondary calcific formations within the pulp result in exhaustion and final death of that organ. In view of this fact he decries the practice of stimulating secondary dentin and urges the use of non-conductive materials beneath all fillings which are in proximity to the pulp.

CONTRIBUTION TO THE PATHOLOGY OF THE PULP.

Eugene S. Talbot has reviewed the work which he has done upon the pathology of the pulp, in his book entitled "Developmental Pathology." Chapter xxviii of his work treats of the dental pulp and opens with a general statement as to its evolution and development. The author then considers the possibility of the existence of a lymphatic system in the pulp. He states that he has been unable to demonstrate the presence of lymphatics, but describes oval spaces, without walls, in the pulp tissue, the nature of which is not clear. Whether there be lymphatics or not, the author

is very certain that the pulp has a good regenerative process by which diseased and abscessed areas are repaired and restored to health.

After describing the vascular and nervous systems of the pulp, Dr. Talbot takes up the consideration of its pathology. He states that the causes of pulp disease are changes in the blood stream which are due to poisons circulating in the blood. These poisons are, in the opinion of the author, the result of degenerative conditions, and may produce in the pulp a faulty metabolism and auto-intoxication which make it susceptible to any of the pulp diseases. Such a pathological degeneration begins as soon as the apex of the root of the tooth is closed.

Because of its structure and physiology the pulp is very susceptible to inflammatory changes. According to the author, in cases of obstruction the intravascular pressure alone is sufficient to produce rupture of the capillaries and marked diapedesis. The absence of lymphatics and collateral circulation causes the pulp to pass quickly from hyperemic states, through inflammation, to death by coagulation, stagnation, neurosis, or thrombosis.

In the consideration of pulp abscesses it is stated that they may occur at any location. A number of excellent photomicrographs are shown in which abscesses may be seen in their various stages, from that of areas of small cell infiltration to large abscesses and complete dissolution of tissue. The sections show degenerating odontoblasts and nerve fibers, and thickened arteries. One particularly fortunate section, "Figure 330 shows A, a circumscribed area of acute inflammation about to liquefy and form an abscess, C, a fully formed abscess, and B, the cicatricial tissue of an old abscess showing conclusively that restoration of a diseased pulp is possible." These illustrations are followed by several showing nerve-end degeneration, with cases of specific Wallerian degeneration.

The author then takes up the discussion of the various pulp diseases, and illustrates many with sections. He speaks of the pulp as being an end-organ, without collateral circulation or lymphatics and having but a single exit for its venous circulation all of which renders it susceptible to thrombosis. The thrombi are described as being due to the embolism of the products of degeneration, fat droplets, tissue fragments, tumor cells, air, etc.

Inflammation of the arterial coats is spoken of as being very common. He calls the pulp "a unique end-organ whose arteries are susceptible to obliterans and arterio-sclerosis, which predispose to degenerations and necrosis." The causes of this condition are stated as being auto-intoxication, and drugs taken systematically which may become irritants, syphilis, gout, rheumatism, Bright's disease, alcoholism, and metal poisons.

As a result of arterio-sclerosis in the pulp, cloudy swelling and fatty degeneration occur, which conditions are often associated with typhoid fever, septicemia, and other acute infections and toxic diseases. Amyloid and hyalin degeneration is described as well as the various calcific concretions which so readily form in degenerating pulp tissues.

In his conclusions Dr. Talbot states that the causes of pulp diseases are changes in the blood current due to circulating poisons which result from degenerative conditions occurring at the stress periods of life; that pathological degeneration of the pulp begins when it has ceased to form dentin and the apical end is nearly closed; that inflammatory processes of the pulp may pass through all stages from infection to abscess without pain; and that all forms of degeneration, together with the pathological processes of evolution, are the direct causes of tooth decay.

NEOPLASMS OF THE PULP.

Some very valuable contributions to our literature of the dental pulp have been made by Dr. Vida A. Latham. Of these there are two which deal with the pathology of that tissue, the first of which is an article entitled "Neoplasm of the Pulp," published in the *Journal*

of the American Medical Association for 1904, p. 535. In this the author describes a case of tumor growth in the pulp of a tooth, and shows a number of very beautiful slides made from photomicrographs of the diseased tissue.

After having reviewed the literature upon these growths and having shown how little has been written upon this class of pulp diseases the author describes the case in hand. The patient was an elderly woman age fifty-six, stout build, neurotic type, who had had two sisters die of cancer. She complained of a neuralgia about the right side of the face. There were but few teeth in the mouth, among which the upper right first premolar and canine alone showed any peculiarity. The former of these had a reddish color, while the canine was of a greenish-white tinge which made it very conspicuous. Both pulps were alive and there was no evidence of caries. The teeth were extracted and the pulps of each were examined. That of the canine had a firm hard appearance like that of a fibroid tumor, and was spongy to the touch like a myxoma.

In the sections made there were (1) evidences of granulation and pulpitis; (2) slight sclerosis; (3) slight hyaline degeneration; (4) vessels surrounded by a fibrous thickening; (5) many polynuclear cells scattered in the tissue and massed in areas like round-cell infiltration; (6) cancer-like nests of cells, and hyaline areas near the periphery of the pulp.

In a discussion of these new tissue formations, Dr. Latham asserts that they were carcinomatous, of epithelial character. She offers no explanation of the origin of these epithelial cells, occurring as they did in a mesoblastic tissue. The statement is made that the odontoblasts are readily affected in pulpitis, they being found in every stage of degeneration. They are often exfoliated and atrophied like the ciliated cells of the bronchi. The author makes the suggestion that the epithelial origin of the cancer cells might easily be explained if we could but show that the odontoblasts were developed from the epithelium. The only other possibility of epithelial anlage is that of the nerve tissue in the pulp.

Among the conclusions of the paper attention was called to the fact that there were no prominent symptoms in the case aside from a slight neuralgia; that neoplasms of the pulp are rare and the literature upon the subject very scarce; and that studies should be put upon these neoplasms with reference to their significance and the possibility of metastases.

INFLAMMATORY DISEASES OF THE PULP.

In a second paper, entitled "Some Pathological Features of the Pulp," which appeared in the *Journal of the American Medical Association* for 1906, p. 916, Dr. Latham has reviewed the inflammatory diseases of the pulp, giving illustrations of the various phases of pulpitis. In opening the discussion of the subject the author deplores the fact that the normal histology is not well understood and that the symptomology of the various pathological states of the pulp is not clear.

In the study of the inflammatory conditions of the pulp the following data are suggested for consideration: (*a*) the delicate structure of the pulp is apt to undergo rapid secondary changes after an inflammatory attack, whether from constitutional or local causes; (*b*) its location and poor methods of egress for exudations and dangers from compression; (*c*) fissures and lesions of dentin and enamel are not always able to recuperate for perfect repair; (*d*) if a pulp has been exposed it is difficult to disinfect and hermetically seal; (*e*) the liability of entrance of bacteria through cracks in the dentin even before the pulp has been exposed by decay; (*f*) abnormally large and irregular pulps in some teeth; (*g*) the absence of a lymphatic system in the pulp.

The article then takes up the etiology and symptomology of inflammation in general. The various infections are discussed in regard to their avenues of entrance to the tissues, and the resistance which is offered to them by the tissues. The avenues of entrance of irritation to

the pulp are stated as follows: (1) by direct exposure as a sequel to caries, erosion, abrasion, fracture, etc.; (2) exposure of dentinal tubuli through trauma, fillings, etc., and transmission by the fibrils of irritating stimuli such as acids, metal fillings, etc., too close to the pulp; (3) through the apical foramina as a sympathetic depression from some other source; (4) by contact with the periodontal membrane when it is diseased.

In the discussion of the pathology of pulpitis the author shows sections of pulps in which slight irritation has given rise to a mild inflammation, which has subsequently been reduced by early resolution. Other sections are shown in which the inflammation has gone on to the formation of arterio-sclerosis and thrombosis, which condition is frequently associated with chronic inflammation of the periodontal membrane and pyorrhea. The author describes similar cases in which there is a marked change in the odontoblastic layer, which has been replaced by a thick membrane-like layer containing giant cells. Dr. Latham further states that these cells destroy portions of the pulpal wall of the dentin to enlarge the pulp chamber, and may later replace the lost tissue with a poor grade of dentin or osteodentin.

It is the belief of the essayist that a large number of inflamed and diseased pulps may recover if the cavities and the cracks in the teeth be sterilized and if the patient be in good health. As to the occurrence of pulpitis, it is stated that the upper premolars, canines, and incisors are more susceptible than the corresponding lowers, but in the molars the lowers suffer more than the uppers.

In conclusion the author says: "The loss of control of the vascular system of the pulp and obstruction in vessels followed by inflammation are probably factors in interstitial gingivitis which may be the cause of the gingivæ losing their normal function and so aiding in the progress of the disease. The interference with the vascularity of the bone, the arteritis obliterans in the pulp and peridental membrane produce venous hyperemia of the gums (acute or interstitial), changes in the mucous glandular structure, and finally atrophy and osteomalacia."

LESIONS IN VITAL PULP DUE TO GOLD RESTORATIONS.

Two papers have appeared which treat of the resultant pathological conditions in the case of living pulps beneath gold shell crowns and other large restorations. Both of these articles condemn the practice of leaving vital pulps beneath such extensive gold operations. The first paper, entitled "Pathological Lesions of the Living Pulp under a Gold Shell Crown," by M. L. Rhein, appeared in the *Items of Interest* for 1909, p. 561. In this paper Dr. Rhein calls attention to the pathological conditions which may be found in pulps under gold shell crowns, especially degenerations going on to calcifications of the pulp. As an illustration he reports a case in which the pulp was removed from a tooth which had been crowned, and sections were made of the tissue thus obtained. The photomicrographs show a marked degeneration and a tendency to calcification throughout the pulp.

The second paper, a more comprehensive treatment of the subject, appeared in the Dental Cosmos for 1910, p. 389. It was entitled, "The Adventitious Effect of Large Masses of Gold in Contact with Tooth Tissues," by I. N. Broomell. He first reports a case in which two pyorrhetic teeth which had served as bridge abutments were removed and an examination was made as to the condition of their pulps. In these are shown changes in the odontoblastic layer and an atrophy of the pulp cells. The bloodvessels were enlarged and sclerotic, while the dentin was largely disintegrated with the formation of interglobular spaces. All of these changes the author attributes to the adventitious effect of the mass of gold used for the attachment of the bridge to the tooth. The writer of this report is struck with the marked similarity between the sections of this case and the sections shown by Dr. Latham

of pulp changes as the result of pyorrhea. This leads us to inquire as to how much of the pulp change in Dr. Broomell's case was due to the gold, and how much to the pyorrhetic condition of the teeth.

Other cases are cited by Dr. Broomell, in which a more specific effect of the irritation of gold is seen. In one case suppuration of the pulp had been produced beneath a large gold filling. The dentinal fibers of this specimen showed club-shaped enlargements and a large amount of calcific degeneration had taken place. Still another case was that of a woman about forty-five years of age, of highly nervous temperament, with teeth which were hypersensitive under normal conditions. A gold shell was placed on a lower bicuspid which was free from caries with but little cutting of the enamel. After setting the crown an acute pulpitis resulted immediately, and it became so marked as to require the removal of the crown. The crown was reset after ten days and a little later the tooth was extracted because of pain. An examination of the pulp showed a marked increase in the number and size of the odontoblasts, and characteristic hyperemic and acute inflammatory conditions of the pulp. It was evident to the author that "The disturbance in the pulp was due to the thermal influence of the gold casing upon the terminal branches of the dentinal fibers, notwithstanding the fact that they were shielded by a layer of normal enamel." He also states that one of the most probable sequelæ of crowning a tooth with a live pulp is that of dry gangrene. He cites a case in illustration of that view, and shows sections of the pulp which have become shrunken and structureless.

VALUE OF THE PULP TO THE TOOTH.

In the *Dental Forum,* a journal published by the dental alumni association of the University of Buffalo, on p. 12, vol. i, an article is published by Dr. L. M. Waugh, entitled "Some Influences which Affect the Functions and Structure of the Dental Pulp." In this the author reviews the structure of the pulp and its pathology with especial reference to the calcific degenerations and their significance. In a discussion of the value of the pulp to the tooth, Dr. Waugh advocates the removal of the pulp in the following cases:

(1) When decay has so progressed that all of the overlying dentin is decalcified, except in young subjects.

(2) When prolonged pulpitis occurs beneath fillings of some years' standing. This seems especially true of gold.

(3) When operative measures are necessary upon teeth either much abraded or much eroded.

(4) When much dentin has to be removed, in elongating or inclining teeth in preparation for shell gold crowns, especially metallic.

(5) In treatment of advanced pyorrhea.

(6) In facial neuralgia when associated with or superinduced by pulp degeneration.

SECONDARY CALCIFICATIONS OF THE PULP.

In an article entitled "Secondary Calcifications of the Tooth Pulp," which appeared in the DENTAL COSMOS for 1912, p. 157, the writer of this report reviewed the various forms of pulp calcifications and gave illustrations of each. In that article the author has shown that certain forms of calcification which have been slowly laid down and of a good order may be of service to the health and vitality of the tooth, while those calcifications which are formed rapidly in response to a severe irritation are of a poor order and are more of a menace than a boon. They interfere with the circulation of the pulp and tend to produce its degeneration and death. The article also calls attention to the severe irritation which is given to the pulp whenever a live tooth is covered with a gold shell crown. If the tooth be properly prepared for crowning, practically all of the enamel must be removed. The cutting of the dentin on the lateral surfaces of the tooth and the subsequent flowing of the cement over the cut surfaces produce a profound irritation upon the pulp through fibrillæ which have not undergone sclerotic changes. "The ex-

cessive stimulation to the pulp in a large number of such cases results in degeneration and death of that organ, so that, although occlusal or approximal fillings may be inserted relatively near to the pulp in teeth which have been affected by abrasion or slow caries, the operation of crowning these vital teeth is unsafe and hazardous in a large percentage of cases."

As a conclusion to a discussion of the value of the pulp to the tooth economy the following statement is made: "From the foregoing we may conclude that a healthy pulp is a valuable asset to the tooth which is to endure direct stress such as mastication or the support of a filling. In teeth, however, which are ground down and entirely covered with crowns, little crushing stress is brought to bear upon the dentin, and the danger of fracture is reduced to minimum; in such cases the pulp is not essential to the welfare of the tooth, and may therefore be removed."

PRESENT STATUS OF THE STUDY OF PULP DISEASES IN THE UNITED STATES.

From the *résumé* which has been given, it will be seen that relatively few American investigators have made a detailed and scientific study of the pulp diseases. Much has been written of the symptomology and therapeutic treatment of the various forms of pulpitis, but it has been done from a subjective standpoint, dependent largely upon external and clinical observations. Perhaps that form of inflammation which results in partial or total calcification of the pulp is best understood. This is due to the ease with which sections may be made of these hard concretions and to the abundance of material to be obtained for study.

As to the other forms of pulpitis which involve histological changes in the pulp tissue, but few have mastered the technique of the microscopy of that tissue or studied its diseases from a pathological standpoint. Although much valuable work has been done, there is need for further inquiry into the reaction of the pulp tissue in response to the various stimuli to which they are subjected. In these days of extreme and extensive tooth restoration, a large part of which is being done upon vital teeth, we should look closely into the effect which our large fillings, inlays, and crowns have upon the pulp of the tooth. If their insertion is a source of severe and permanent irritation to the pulp, secondary changes will take place, many of which will result in cases of tic douloureux, septic pulps, and apical abscesses.

We know that the pulp readily undergoes hyperemic and inflammatory changes in response to irritation. We know also that when these irritations are mild and of short duration, the pulp may subsequently recover from the injury and return to normal. But in those cases in which the pulp has undergone more severe inflammatory and degenerative conditions we are very uncertain as to our prognosis. Some believe that no pulps which are seriously affected will ever recover their normal vitality, and should be removed. Others claim that the pulp tissue has great powers of recuperation, and, if properly treated, does recover even in cases of marked pathological disturbance. We need, then, a thorough and systematic study of the pulp degenerations and regenerations, these to be correlated with the irritations by which they are produced and the symptoms which accompany them. Such a study would give us information which we need, and should make our treatment of the pulp more intelligent and effective.

RADIO-ACTIVE SUBSTANCES AND THEIR THERAPEUTIC APPLICATION IN DENTISTRY.

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FIFTEEN years ago nothing was known of radium, polonium, actinium and other interesting substances belonging to this group. In 1896 Roentgen made the world-renowned discovery that certain rays obtained from a Crookes tube would penetrate substances which, under ordinary conditions, are known to be opaque. In the same year the late French physicist, Henry Becquerel, observed that uranium salts, when brought into contact with a photographic plate protected by a tight-fitting cover of black paper, become sensitized. Certain substances are known to possess the power of emitting light rays, *i.e.* they cause fluorescence or phosphorescence. It should be borne in mind, however, that these latter substances have to be exposed to sunlight or artificial light for some time before they re-emit some of this stored-up energy in the form of light rays. On the other hand, minerals which contain uranium will bring about the same phenomenon without being previously exposed to light rays.

Light is a form of energy; it cannot be completely destroyed nor can it be created out of nothing. Since uranium salts produce light rays apparently indefinitely, it was supposed that they must contain certain specific substances which possess, as an inherent property, the power of light emanation. The isolation of these substances was finally accomplished, and their discovery is primarily to be credited to the late Professor Pierre Curie and to his wife, Mme. Curie, *née* Sklodowska, of Paris. Both experimenters worked with crude uranium minerals and from it they isolated radium—the radiant—and polonium, so termed in honor of Mme. Curie's native country, Poland. Shortly after the discovery of these two elements, Debierne of Paris isolated a third radio-active element from the crude uranium, which he named actinium.

SOURCES OF RADIUM.

The chief minerals from which radium is derived are carnotite or chalkolite, and pitchblende. Carnotite is found in several of our western states, especially Colorado and Utah, while the chief source of supply of pitchblende is Joachimstal, a mining town of Bohemia. It is from the latter substance, pitchblende, that practically all the available radium of Europe—and, to a large extent, of our country as well—is obtained. The quantity of radium present in the various minerals is extremely small, about five million parts of pitchblende containing one part of radium. A ton of pitchblende, containing about fifty per cent. of uranium, furnishes about two grains (0.13 grams) of radium. To extract this small quantity, tedious mineralogic processes are necessary. The present available amount of radium throughout the whole globe, expressed as the bromid salt, may be estimated at about an ounce and a half (45 grams), which represents a value of about five million dollars. One milli-

gram, *i.e.* about one-sixty-fourth of a grain, is listed at one hundred dollars. Speaking of dollars, it is of interest from an etymologic point of view that our American dollar owes its name to this little town of Joachimstal.*

RADIO-ACTIVE SUBSTANCES.

These may be classified in three distinct groups: Actinium, thorium, and uranium. Each primary element, by transmutation, transforms itself into a number of other substances. According to Rutherford and Soddy, all radio-active substances are continuously undergoing transformation. During the transformation of a radio-active element, another element is created whose atoms possess less power of emanation than is possessed by the one from which it is created. Restricting our discussion to uranium and thorium only, the following substances derived from the respective mother substances may be enumerated: Uranium, Uranium X, Ionium, Radium, Radium emanation, Radium A, Radium B, Radium C, Radium D, Radium E, and Radium F. Thorium, during the process of transformation, produces the following so-far-known substances: Thorium, mesothorium, radiothorium, Thorium X, Thorium emanation, Thorium A, B, C, and D. Incidentally, the products of transformation possess a variable period of "life," *i.e.* time of existence. A specific quantity of radium decomposes by about one-half in seventeen hundred years, radium emanation in 3.8 days, radium A in three months, radium B in twenty-six minutes, radium C in nineteen minutes, radium D in twelve years, radium E in six days, and radium F in one hundred and forty days.

Radium is an element closely related to barium in its chemical behavior. It is a white metal, melting at about 1316° F. (700° C.), and energetically decomposes water. Aside from the ordinary properties possessed by the barium group, it is endowed with three remarkable additional functions: It emits heat continuously at a constant rate, it is the source of radiation, and it generates a gas which is radio-active. The amount of continuous heat produced by one gram of radium equals about 135 calories per hour, or, to put it in other words, the total amount of heat given off by one pound of radium is about equivalent to that produced by the combustion of 250 tons of coal.

RADIATION ENERGY.

The transformation of one radio-active element into another is accompanied by the liberation of various rays, which are known as the alpha, beta, and gamma rays. Alpha and beta rays are not true rays; the alpha rays are positively charged ions of helium given off by the element, while the beta rays are negatively charged ions. The gamma rays are true rays; they do not contain free ions and are very similar to the Roentgen rays. The gamma rays are not distorted in a magnetized field, while the other two rays are turned to the right or left respectively. The power of penetration of these various rays differs markedly; the alpha rays are least active, the beta rays are slightly more so, while the gamma rays pass through a sheet of lead one centimeter thick, the human body, the walls of a house, etc. The relationship of the radiation of these various rays may be expressed by the equation, 1 : 100 : 10,000.

METHODS OF ESTIMATING AND MEASURING RADIO-ACTIVE EMANATION.

Until recently, the strength of radio-active substances has usually been expressed in Mache units—a Mache unit representing 0.001 electrostatic unit as measured by the amperemeter and mul-

* During the sixteenth to the eighteenth centuries, the mint of Joachimstal furnished a coin known as a "Joachimstaler," which on account of its high grade of pure silver content was the favorite means of exchange through western Europe and the Levant. Later, the "taler," as the coin is familiarly known, became the standard of exchange in the German-speaking districts of Europe, and from its Low-German derivative, daaler, the American "dollar" derived its name.

tiplied by 1000. At present, to standardize this somewhat arbitrary method, the term "curie" is employed. A curie represents the amount of emanation in equilibrium with one gram of radium; a "microcurie," *i.e.* one millionth of a curie, is the amount of emanation in equilibrium with 0.001 milligram radium. A microcurie equals about 2500 Mache units. The various rays emanated by radio-active substances act upon photographic plates, they produce fluorescence in certain bodies, they electrify gases, and they produce measurable quantities of heat. Upon these factors are based the various methods of measuring the radio-active emanation, *i.e.* the radiographic, the fluoroscopic, the electric, and the thermic. Various ingenious apparatus have been devised to accomplish these purposes.

CHEMICAL ACTION OF RAYS.

The chemical effect of the rays is manifold; their action upon silver salts present in a photographic plate led to their discovery. Especially easily affected are the simpler salts. Rock salt assumes a yellow color, while melted borax turns blue. Glass in which radio-active compounds are kept becomes variously affected. At first, it assumes a light blue color, which in time changes to a dark violet blue. Most interesting is the effect of emanation on precious stones, *i.e.* amethyst changes to deep violet, sapphire to yellow, diamond to a bluish or brownish hue, etc. An interesting observation is related by Bordas. He obtained some corundum stones of a cheap kind from a jeweler. After keeping these stones in a closed box containing some highly active radium salt for a month, all the stones had changed their color: the colorless corundum had become yellow like topaz, the blue ones had changed to a rich green, and the violet stones had taken on the color of the sapphire. The coloring was so perfect that the same jeweler was willing to buy back the same corundum stones as genuine precious stones at twenty-five times their original price. Alpha rays decompose water into free hydrogen and oxygen, the beta rays produce hydrogen from water, while the remaining oxygen unites with some of the water to form hydrogen dioxid. Many other chemical changes are known, *i.e.* water may be produced from free hydrogen and oxygen, etc. As yet, nothing definite is known regarding these peculiar chemic effects of radio-active substances.

BIOLOGIC AND PHYSIOLOGIC ACTION OF RADIO-ACTIVE SUBSTANCES.

Every living cell, when subjected to radium emanation, is influenced by it; however, the reaction of the cell depends upon its specific nature and upon the kind of rays employed. In consequence, certain tissues are more easily amenable to the rays than others. Nervous tissue reacts most energetically, while intestinal and serous tissues are far less strongly influenced. Muscle tissue is the least reactive. Connective tissue, when subjected to the rays, is readily stimulated to proliferation. Histologic examination indicates that the typical phenomena of inflammation, with their long chain of changes, *i.e.* from an early hyperemia to the final necrosis, may be produced at will. The internal organs react in various ways; readily influenced are lymphoid tissues, especially the spleen, less so the kidneys, and still less the salivary glands and mucous membrane. No living tissue will stand the prolonged exposure to the rays without showing some definite change, and it is immaterial whether the tissue is of animal or vegetable origin. Ferments, on an average, are slightly activated. Saliva ferments are usually at first slightly paralyzed and later activated; the results obtained, however, are so very variable that little significance can be placed on these observations. Low-type organisms, *i.e.* bacteria, protozoa, etc., are comparatively very slightly influenced by radiation. Upon pathological tissues the effect of the rays is much more pronounced than upon normal structure, hence the great significance of the rays

in the treatment of diseases. As stated by Sticker, pathological tissues react to the gamma rays according to the following scale: Leukemic tissues, mycosis, eczema, sarcoma, carcinoma, lupus, tubercular ulcers, lipoma, myoma, and fibroma. The physiologic effect, as Von Norden expresses it, results in an internal electric ionization of the tissues. So far, no danger from the application of small doses of emanation have been observed; large doses are productive of destructive results. From a therapeutic point of view, innumerable diseases have been subjected to the effects of radium emanation. In due time it was found that specific results were obtained in certain forms of skin diseases, including neoplasms, in disturbances of metabolism, especially gout, and in painful alterations of the nervous system, *i.e.* neuralgia, locomotor ataxia, etc.

METHODS OF APPLICATION OF RADIO-ACTIVE SUBSTANCES.

Of the various radio-active substances, radium and mesothorium in numerous modifications are the principal elements employed therapeutically at present. The salts of these elements may be preserved in small metal, ebonite, or other suitable containers, covered by a filter usually consisting of a thin sheet of mica or aluminum. Various-shaped tubes, boxes, sounds, compresses, etc., are available so as to conform to the various types of body surfaces and cavities. If a radio-active substance is to be administered in the form of gas emanation, it is preferably carried out in an inhalatorium. Many of the well-known sanatoriums of Europe and the United States are at present provided with such radium emanation inhalatoriums. For the internal administration of radium emanation, water artificially charged with radio-active gases or with the dissolved salts, or natural springs containing radio-active substances are chiefly employed. For the charging of water with radium emanation, various methods are in vogue. The water may be charged by direct solution of a soluble radium salt, *i.e.* the bromid or the chlorid, or by submerging a very finely powdered insoluble salt, *i.e.* the sulfate. To present as large a surface as possible, the insoluble radium salts are employed in various modifications. They may be precipitated upon asbestos in a porous cell, they may be mixed with charcoal and formed into slabs, they may be mixed with cement and formed into balls, and lastly, they may be mixed with clay and fired. Most of these processes of subdividing radium salts are protected by patents. The "life" of these various modifications of radio-activity is usually very prolonged; the fireclay rods, it is estimated, may be used seventeen hundred years, and still have one-half of their radium content available.

For many centuries it has been known that the water of certain mineral spas is endowed with peculiar therapeutic qualities which cannot be attributed to the organic or inorganic constituents of these spas. It was found that certain artificially compounded mineral waters prepared according to formulas obtained from most carefully conducted analyses will not produce the same therapeutic effects as the water employed at the respective spas. While climatic conditions, change of environment, and similar factors no doubt play an important rôle in balneologic therapeutics, the fact remains, however, that the water of certain spas, when drunk at the springs, exercises some peculiar beneficial effect on the sick. To explain these curious properties, folk-lore has endowed certain springs with mystic spirits, the "Brunnengeist," the "spirit of the spring," as it has been appropriately designated in bygone days by the Germans. Soon after the emanation of radium had become an established fact, investigation was carried on in the hope of finding similar possibilities possessed by the various spas, and it was discovered that many of the famous watering resorts owe their renown in a large measure to the presence of radium emanation in their spas. The more important watering resorts of Europe containing emanation are: Bath, Baden-Baden, Gastein, Landeck, Joachimstal, etc.

THE APPLICATION OF RADIO-ACTIVE SUBSTANCES IN DENTISTRY.

Radium was introduced into dental therapeutics in 1912, by M. Levy of Berlin. Aside from his numerous publications, the writings of Walkhoff, Trauner, Mamlok, Léger-Dorez, Warnekros, and many others are available to the inquiring student. According to Levy, the following oral diseases have been subjected to radium emanation: Psoriasis of the oral mucous membrane, pyorrhea alveolaris, loosening of the teeth without the presence of pus, marginal gingivitis, leukoplakia, chronic aphthæ, fistulas, and ulcerative stomatitis caused by gout. The therapeutic application of radio-active substances about the mouth may be accomplished by utilizing the following methods and means: The drink cure, mouth-washes, tooth-pastes, compresses, injections, irrigation, inhalation, and finally, variable combinations of these procedures. The drink cure and the application of the mouth-washes are probably the two most prominent means of utilizing radium emanation for such purposes; the other enumerated methods are of questionable value. The technique of the various methods is comparatively simple. As a drink cure, Levy recommends the following procedure: Water charged with emanation, or water containing a specific quantity of a soluble radium salt may be used. The radium content should correspond to about a thousand to 3000 Mache units per day, although higher concentrations have been used with no deleterious side-effects. Every twenty to thirty minutes during the two or three hours following the three main meals, a small quantity of the charged water should be taken. The object is to furnish the organism with small quantities of the products of decomposition of radium, which are slowly absorbed. In due time they reach the blood current and finally are eliminated, primarily through the lungs and to a less extent by the urine, the skin, perspiration, and the saliva. Within twenty minutes after partaking of 600 Mache units, radium emanation has been shown to be present in the saliva. As a gargle, Trauner recommends the following procedure: A quart of water containing about 375 Mache units forms the basis of the mouth-wash. Of this solution, the patient uses two glassfuls (about 10 fluid-ounces each) per day as a mouth-wash, observing the following precautions: Every dose of the solution—which should not be too large, so as to find ample room in the mouth—has to be worked forcibly between the cheeks and the teeth for at least a minute and a half, so as to de-emanize the water. The water should then be removed from the mouth slowly and in a thin stream. The emanation will separate from the water and precipitate itself upon the mucous surfaces of the mouth. From twenty to thirty minutes are necessary to use up the content of a glassful of the solution. After the gargling, the patient should not eat or drink, and if possible should not speak, for at least one or better two hours, to retain the gaseous emanation in the mouth. With this simple procedure Trauner claims to have obtained most remarkable results. The formation of pus and subjective symptoms are checked in two or three days, remaining only, and to a milder degree, upon those places where accumulations of calcarious deposits are present. The tartar has to be removed thoroughly, and at future sittings careful examination has to be made for remnants of tartar, which represent a constant and sure source of pus production. Large-sized pockets are successfully treated by syringing with two cubic centimeters of a concentrated emanation solution.

If one wishes to obtain a comprehensive view of the present state of radium emanation in therapeutics, one is at once confronted with the enormous mass of accumulated literature. Within the last three years, aside from numerous exhaustive treatises, more than a thousand articles have appeared in current professional journals. The early glowing reports of 1912 and 1913, which in many

instances bordered on therapeutic hysteria, fortunately have been superseded by the more sane and unbiased observations of broadminded practitioners. Radium treatment is slowly settling down to the specific phase in medical practice to which undoubtedly it is entitled. During the year's sojourn in Europe (1913–14), the writer had the opportunity to familiarize himself with the present status of the application of radio-active substances as employed in the alleviation of dental diseases. The two dental institutes which have primarily investigated radium therapy are the two institutes of the University of Berlin and of Graz. At the Berlin Institute, Zahnarzt Mamlok, and at Graz Professor Trauner, have carried out extensive investigations on the subject, and both gentlemen have been most courteous in furnishing patients and offering their experience to the writer, which he hereby gratefully acknowledges. Parenthetically, it may be remarked that both gentlemen are close observers and sound in their judgment. Trauner is still an ardent advocate of radium therapy, and he is convinced that its influence is very marked in the treatment of inflammatory conditions of the oral mucous membrane. On the other hand, Mamlok is rather skeptical at present, and he sums up his experience by stating that the prolonged utilization of water charged with radium emanation has a tendency to lower the virulence of the ordinary pus bacteria usually found in inflammatory conditions of the mouth. He has obtained good results in the treatment of pyorrhea alveolaris by combining the following procedures: Careful removal of all tartar deposits, establishing perfect occlusion, splinting of loose teeth, application of radio-active substances, and rigid oral hygiene. It was observed that patients who suffered with pain in connection with their dental ailments were unanimous in their statements that washing with radium-charged water relieved this condition, like "magic," as they expressed it. Of the many other benefits claimed by dental practitioners and patients alike relative to the therapeutic effects of radium mouth-washes, pastes, etc., the writer is extremely skeptical. He has not been able to observe any special value derived from such procedures. In a number of counter-tests, in which a warm physiologic salt solution was substituted for the radium preparations, the comparative results obtained were equally as good. At the meeting of the German National Dental Society, the Central Verein, held in May 1913, the enthusiasm relative to radium therapy probably had reached its zenith. It had leaped up in sky-rocket fashion, and, following the law of gravitation, came down at an equally rapid rate. At the 1914 meeting of the same society, aside from a few derogatory remarks, one noticed a conspicuous absence of discussion on this supposed panacea for all bodily ills. As the writer has stated above, radium seems to be entitled to a legitimate place in general therapeutics. So far as its application in the treatment of oral diseases, especially pyorrhea alveolaris, is concerned—for which it has received the bulk of its indorsement—at present no positive results can be recorded.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

NITROUS OXID ANALGESIA IN GENERAL DENTAL PRACTICE.

By E. B. PRENTISS, D.D.S., New York, N. Y.

(Report of the Correspondent, presented to the Dental Society of the State of New York at its annual meeting, Albany, May 14, 1914.)

FOR a great many years, nitrous oxid has been employed as an anesthetic in the extraction of teeth. For such operations it has justly earned a great reputation, because of the comparative ease of its administration as well as the lack of any ill-effects upon the patient. It has been known as the safest of all general anesthetics. The general surgeon has made more or less frequent use of it for minor operations, especially short ones; also, during more recent years, he has come to use it quite generally as an easier, quicker, and more pleasant method of beginning the anesthesia when ether is to be used in continuance during long operations.

During the last five or more years the attention of the dental profession has been called to the possibilities of nitrous oxid combined with oxygen as a means of producing a condition of analgesia, which may be continued for a considerable period of time, sufficient, at least, for performing all ordinary operations about the mouth and teeth.

THE OPERATOR'S RESPONSIBILITY.

Very little seems to be known about its action or effect upon patients by the average dentist, and I think the majority of us feel that it has not had a sufficient test to warrant us in assuming the added responsibility for the safety of the patient which its use imposes upon us. This responsibility seems to be considerably out of proportion to the importance of the average dental operation in which its use is indicated.

Within the past two or three years, especially, there has been great activity on the part of the manufacturers of different machines. I feel that nearly all, if not all the knowledge which most dentists have of nitrous oxid and oxygen has come through the *so-called* "Special Courses in Anesthesia and Analgesia" conducted by men who are paid to advertise these machines. These men, being graduated dentists and having spent a great deal of time in perfecting themselves in administering nitrous oxid, have been able to convince a good many practitioners throughout the country that it is a "very simple matter for anyone to become proficient in its use after a few trials."

A comparatively few have become proficient in its use, and have found it of great benefit in their practices. To hundreds of others, however, it has undoubtedly been a disappointment, while in the hands of a great many other operators, it is a source of great danger to the patients who intrust their lives to their care. In conducting my investigation on this subject, I have carefully avoided obtaining information from anyone who is known to be interested personally in the manufacture or selling of any apparatus.

INQUIRIES ADDRESSED TO DENTISTS AND PHYSICIANS.

I have tried to conduct this inquiry along purely scientific and professional lines, and hope that this report will be entirely free from all commercial influences.

Two forms of letters have been sent, one to dentists and another to physicians or surgeons. The following is a copy of the letter sent to dentists:

My dear Doctor,—As Correspondent of the New York State Dental Society, I am seeking information upon the subject of "Nitrous Oxid Analgesia in its Relation to General Dental Operations."

Will you be kind enough to state your personal opinion, if possible based upon clinical experience, regarding the following questions:

(1) In about what proportion of your operations do you find nitrous oxid analgesia of benefit either to your patient, yourself, or both?

(2) Do you find that the present-day equipment is perfected to such a degree that it incurs no great inconvenience to the operator in his work? And is an assistant required to handle the apparatus?

(3) Do you consider that the dentist should take any special course in anesthesia in order to qualify for the safe administration of nitrous oxid in operations of considerable duration?

(4) In what proportion of cases have your patients experienced bad effects from its use?

(5) Considering the subject from all possible angles, is it your opinion that nitrous oxid should form a part of every dentist's equipment?

An early reply will be appreciated, in order that I may incorporate it in my report to be given at the annual meeting of the State Society in May.

Thanking you in advance for any information you may be able to give,

Very truly yours.

The letter sent to physicians was the same, except the questions, which were as follows:

(1) In administering nitrous oxid and oxygen for continued analgesia as required in ordinary dental operations, what are the probable or possible ill effects, if any, upon the system?

(2) Do you consider that the dentist should take any special course in anesthesia in order to qualify for the safe administration of nitrous oxid in operations of considerable duration?

(3) Considering the subject from all possible angles, is it your opinion that nitrous oxid analgesia would be a safe adjunct to the average dental operation?

The replies received, except in two or three instances, were brief. They are as follows:

REPLIES FROM DENTISTS, FAVORABLE AND UNFAVORABLE.

(1) Dr. T. B. Hartzell, Minneapolis, Minn.:

My dear Dr. Prentiss,—In answer to your first question, would say that I find nitrous oxid analgesia of advantage in all minor operations upon the teeth where the matter of avoiding pain is a consideration.

In reply to question No. 2, would say that my answer to that question depends on the character of apparatus used.

There are three types of apparatus in use for the administration of nitrous oxid: The first is one in which there is no attempt to control the dosage, in which the patient is given full inhalations of nitrous oxid until he reaches the condition of anesthesia; then there is nothing to be done but to cease administering and operate. That is a very old type of apparatus.

The next type of apparatus seeks to control the flow and mixture of the gases, and in this type the manufacturers usually provide two bags, each holding about a gallon, oxygen being discharged into one and nitrous oxid into the other, and allowed to mix according to the symptomatic needs of the patient and the judgment of the anesthetist.

The gases in this type of apparatus, coming in some cases directly from the cylinders to the bags, are held in moderate restraint by pressure regulators, which roughly indicate the amount of gas flowing. Of this type of apparatus there are several on the market, notably the Teter, Clark, McKesson, and others.

The third type of apparatus, the most perfect of all, is so devised that the gases can be administered in known quantities and the percentage of each gas accurately controlled, and this control is so perfect that the operator can, after arranging his anesthetizing machine to deliver a certain mixture of nitrous oxid and oxygen, depend on that mixture remaining constant, thus giving an even, satisfactory anesthesia in which it is impossible to overdose the patient, because the machine will not permit of the patient's receiving more than a certain accurate flow of the combined gases. In this type an assistant is not required to handle the apparatus, and any change in the proportion of the gases flowing is indicated by delicate gages, which instantly record that fact in full view of the anesthetist.

In answer to your third question, would say that I do consider that everyone who at-

tempts the matter of general anesthesia should have special instruction in general anesthesia from a man who thoroughly understands the science of anesthesia; *not from some traveling salesman* who is out to sell the apparatus.

In reply to the fourth question, would say that when the gases are accurately proportioned and carefully administered there are no bad effects, if the individual to whom the gas is being administered has been properly prepared for the anesthetic. If, on the contrary, the anesthetic is administered immediately after eating, there will be a certain amount of nausea and depression in many cases, and this is just as true of nitrous oxid and oxygen as of ether, chloroform, or any other anesthetic. Proper time and condition of the administration is important in anesthesia as well as analgesia. The digestive processes are inhibited under general anesthesia, and if the stomach contains a mass of partially digested foods, fermentation and nausea will ensue under any anesthetic.

There is still another factor in the preparation of the patient which is vastly important in any type of anesthesia, whether it be produced by gas, ether, or chloroform; this is the existence of fear or anger on the part of the individual being anesthetized. During fear or anger, the physiological action of certain glands of the body produces substances which in exaggerated amounts vastly increase the danger of the anesthetic to the individual.

In regard to the last question, would answer, No. The nitrous oxid equipment should form a part of every man's equipment who is capable of using it, and who has work that demands its use. I would like every dentist to equip himself with a microscope, but how many dentists do you suppose would use a microscope, if they had one? I will say this, however, that every dentist who desires to practice painless dentistry and who will train himself in anesthetic matters will be given increased comfort and so will his patient, if he does make such apparatus a part of his equipment.

Very cordially yours.

(2) Dr. Chas. F. Ash, New York City.

My dear Dr. Prentiss,—Replying to yours of March 28th, in answer would say:

(1) I suppose I use nitrous oxid in 20 per cent. of my cases.

(2) Equipment is not perfected to a degree where it incurs no inconvenience to the operator, and I believe the equipment is capable of much further development; I believe also that an assistant should be a graduate nurse, and that such an assistant is absolutely indispensable for satisfactory results.

(3) I believe any person administering nitrous oxid or any other anesthetic should make a special study of anesthesia in order to qualify for its safe administration.

(4) I believe I have not seen any bad effects from the use of nitrous oxid. I have seen but one patient who had any disagreeable symptoms after the operation, but that was directly attributable to other causes and not to nitrous oxid.

(5) In answer to question No. 5, I am not prepared to say that it should form a part of every dentist's equipment by any means. I believe that nitrous oxid, while satisfactory in the hands of some people, will be more or less unsafe in the hands of many others.

Very truly yours.

(3) Dr. J. R. Hasbrouck, New York City.

My dear Doctor,—I have been most derelict in disregarding an immediate reply to your letter, and apologize for my rudeness.

Herewith is expressed my observation based upon five years' experience with $N_2O + O$.

In ninety per cent. of cases it ameliorates the unpleasantness of painful operations both to patients and myself.

The modern apparatus seems to me to be faultless, but the necessary efficiency can only be realized when an assistant is employed who is sensitive, alert, and possesses a physiologic and psychic understanding. I consider the services of a qualified assistant absolutely necessary both for the safety and sequential administration of the anesthetic, whether it be carried beyond analgesia or not.

In cases of prolonged anesthesia, I consider it most presumptuous and hazardous for anyone to administer $N_2O + O$ unless a special training and experience has been had.

I can report no conspicuous ill effect save an occasional slight headache or lassitude.

In justice to one's patients and self, I deem $N_2O + O$ a most necessary adjunct in the practice of dentistry, but its intelligent and conservative use should be observed.

Appreciating the honor of your inquiry, I am,

Most faithfully.

(4) Dr. Weston A. Price, Cleveland, Ohio.

My dear Dr. Prentiss,—Your communication of the 28th is received, with its list

of questions relative to nitrous oxid analgesia. Without repeating the questions, the answers I would give would be as follows:

(1) Less than ten per cent.

(2) (*a*) Present-day equipment is very satisfactory; (*b*) an assistant is not required to handle the apparatus, but should always be present.

(3) Yes, if he has not had experience.

(4) Probably twenty-five per cent. of cases are short of satisfactory.

(5) No, not if he is skilful in using other available methods. A great help for a few patients, however.

In regard to your postscript, I would recommend that you write to Dr. George N. Wasser, New England Bldg., who is an enthusiast in its behalf, but not interested, so far as I know, in any machine.

With best wishes, I am,

Yours very sincerely.

(5) Dr. George T. Gregg, Pittsburgh, Pa.

(1) About 2/3, but am using less nitrous oxid; using conductive anesthesia instead.

(2) The apparatus could be improved, especially inhalers. An assistant is essential.

(3) Should take a course.

(4) About 10 per cent.

(5) $N_2O + O$ should be in any office equipment, but I think conductive anesthesia is going to replace it to a very great extent.

(6) Dr. J. D. Hertz, Stamford, Conn.

My dear Dr. Prentiss,—In answer to your inquiries of March 28th, regarding the use of nitrous oxid, I shall be very glad to give you whatever information I can as to my use of same. We have a record of over 700 cases since November 1, 1912; previous to that time we kept no record.

In answer to question No. 1, I would say that I find nitrous oxid analgesia of benefit in at least one-third of my cases, and most decidedly think it of benefit to my patients and myself.

(2) In the great majority of cases I find the equipment of very little inconvenience, and an assistant is not required to handle the machine, as it is seldom that it needs much attention, if it is once set at the analgesic point. But I would not think of using nitrous oxid or any other anesthetic or analgesic without the help of an assistant.

(3) While I think that all the information the beginner can get in the use of anesthesia and analgesia will help him in its administration, on the other hand no amount of theory will give him that proficiency which he can gain only by experience.

(4) Our record shows 21 cases of vomiting and 12 that did not feel normal for from one to several days, and we have had about half a dozen cases that we could not handle at all under either analgesia or anesthesia.

(5) At the present time I am very partial to nitrous oxid, and think that analgesia and anesthesia should be practiced in every office for the alleviation of a great deal of pain that it is otherwise impossible to relieve.

Trusting that the above may be of some slight service to you, I beg to remain,

Yours very truly.

(7) Dr. Geo. N. Wasser, Cleveland, Ohio.

My dear Doctor,—In answer to your questions on "Nitrous Oxid Analgesia in Its Relation to General Dental Operations," contained in your letter of March 28th, would say:

(1) Over 75 per cent.

(2) (*a*) Yes. (*b*) Not necessary, but advisable.

(3) Not necessary for analgesia, but advisable for anesthesia.

(4) Have been giving it over five years, and have never had an unfavorable symptom, and but four cases of nausea.

(5) The dentist who does not make use of nitrous oxid and oxygen is missing the greatest boon that has come to the profession, with the possible exception of the casting process. It gives me great pleasure to answer these few questions, as it gives me an opportunity to express my appreciation of nitrous oxid and oxygen, and tell in part of the beneficial results to both patient and operator.

Sincerely.

The following letter coincides so nearly with my own view of the matter and sounds such a timely warning that I have placed it at the end, where it will leave a lasting impression:

(8) Dr. Henry W. Gillett, New York, N. Y.

Dear Dr. Prentiss,—The following is in reply to your questions concerning nitrous oxid analgesia:

(2) (*a*) No. (*b*) Yes.

(3) Yes.

(5) No, not in its present stage of development.

I have not made enough use of the process to answer questions Nos. 1 and 4.

In spite of the safety of nitrous oxid as an anesthetic, I remain unconvinced that it is right for any operator to assume, as regular practice, the responsibility for the management of an anesthetic, and at the same time carry on an operation that ordinarily requires all his faculties to bring to a successful issue.

Analgesia may at any moment become anesthesia; in fact, the advocates of the practice state that they frequently induce anesthesia at difficult or critical moments.

It is my belief that the fact that an operator has at hand a trained attendant or trained nurse will not provide legal protection for him in case of unfortunate results with an anesthetic used as recommended by the advocates of nitrous oxid analgesia apparatus. If his legal obligations are not safeguarded, then his moral obligations are surely in a precarious situation.

It is a well-recognized principle in surgical practice that the administration of anesthetics and surgical operations are not to be carried on by the surgeon at one and the same time. It is also a recognized principle that the anesthetist should be competent to care for and safeguard the life of his patient in any emergency arising from the use of the anesthetic. I feel that these two points have been minimized by the commercial advocates of nitrous oxid analgesia.

It is to be borne in mind that the present interest in the practice is chiefly commercial —that it is a part of a skilfully organized and sustained selling propaganda on the part of people interested solely in the financial returns, and that, of the thousands of analgesia outfits sold to the profession, not twenty per cent. are in practical use.

It is an unfortunate fact that it seems possible for any manufacturer to command the services of professional promoters, equipped with a high degree of skill and efficiency in the practice of almost any special process, who will gravely assure the profession that duplication of the results—which they have spent years in training themselves to demonstrate so easily and perfectly—is readily possible for any dentist of "ordinary skill." No matter how complex the process, it is only necessary to take a course with the demonstrator at $50 per course, and—presto! throngs of grateful patients and eager competition for a place on the waiting-list!

I believe the ultimate outcome of this commercial effort will be to leave the profession hundreds of thousands of dollars poorer with only some handsome junk to show for it, and to again demonstrate that the professional man, who sells his services to the supply houses as a promoter, either openly or secretly, should be barred from all professional association.

In writing this I do not forget that a few men have given the requisite study to equip themselves for this work, and I realize that they are giving good service. Neither can I forget that, regardless of their efficiency and knowledge, if they assume responsibility for both anesthetic and operation, they are violating recognized surgical standards. Under these conditions, if by any mischance a fatal accident occurs as a result, the expert testimony of the professional anesthetists of the highest standing, so vital to their defense, is likely to be highly critical if not flatly condemnatory.

Yours very truly.

REPLIES FROM PHYSICIANS.

The following replies were received from physicians and surgeons:

(1) Dr. Edward M. Foote, New York.

Dear Dr. Prentiss,—You can find my views on the subject of nitrous oxid gas in the last edition of my book on "Minor Surgery," in which there is a chapter on the different anesthetics.

Answering your questions specifically, I do not think there are any probable ill effects from its use in dental operations, subsequent to the period of the anesthesia. There is, however, a certain amount of danger attendant upon its use, and for this reason, in answer to question No. 2, I should say positively, Yes.

I should say in answer to question No. 3, Yes, if the gas is properly administered by a competent individual.

Incidentally, one might remark that taking a course in medicine does not qualify one to give an anesthetic properly. If such were the case, the hospital interne would never have gained his unenviable reputation for poor anesthesia.

Sincerely yours.

(2) Dr. Alexander Lambert, New York City.

Dear Sir,—I am in receipt of your letter of April 2d asking me to furnish certain information as to "Nitrous Oxid Analgesia in its Relation to General Operations."

Being a medical man, I am not competent to answer all your questions, for they come

under the head of surgical experience and of experience of men who give the anesthetic. There is one point, however, in the second question, as to whether a dentist should take a special course in anesthesia in order to qualify for the safe administration of nitrous oxid. I think there is no question whatever, in answer to this, that he should take such a course. The mere fact that the greater the ignorance the greater the self-confidence in giving the anesthesic is not conducive to the greatest safety to the patient. I have seen a great deal of anesthetics given, both before there were special anesthetists in this city and since then, and I have noticed an enormous difference in the resulting effect upon the patients since anesthetists have come into vogue. There have been less accidents, the patients have recovered more quickly, they have needed less anesthesia, and in all ways it has been better for both patient and operator.

Yours truly.

(3) Dr. Robert T. Morris, New York City.

My dear Doctor,—Answering your letter of April 2d: Dr. R. C. Coburn, of Broadway and 86th st., is perhaps our best authority on the subject of nitrous oxid and oxygen anesthesia. Answering your questions, however:

(1) The chief danger appears to consist in the patient's coming out from under the influence—while we are at work—sufficiently to suffer from the effects of the strong stimulus or shock being sent into the centers of consciousness from the field of operation.

(2) I should consider it by all means desirable for the dentist to take a special course in anesthesia, in order to qualify for the safe administration of nitrous oxid or its combination anesthetics.

(3) Nitrous oxid anesthesia is perhaps the safest adjunct among anesthetics for the average dental operation.

Yours truly.

(4) Dr. Karl Connell, New York City, assistant surgeon, Roosevelt Hospital.

My dear Doctor,—In reply to your questions, it is my belief:

(1) That continued analgesia will have no detrimental after-effects except occasional headache and nausea, providing that the gases be pure, and nitrous acid poisoning be avoided.

(2) Nitrous oxid for prolonged operations is far more dangerous in unskilled hands than ether and chloroform; high training is essential.

(3) Nitrous oxid analgesia, with a percentage of from 8 to 20 per cent. oxygen and allowing some dilution with air, will be a safe adjunct for dental practice. At present, proper control of amount and percentage is not obtainable except by the experienced administrator.

Sincerely yours.

(5) Dr. R. C. Coburn, New York City (of whom Dr. Morris speaks).

Dear Dr. Prentiss,—Replying to your letter of the 6th inst., I would make the following answers to your questions:

(1) The *probable* ill-effects resulting from nitrous oxid and oxygen in continued analgesia, if the blood is kept well oxygenated, are nearly *nil.* There are, however, some *possible* ill-effects, especially in those suffering from cardiac disease and arterio-sclerosis. Cyanosis increases the blood pressure, thereby throwing extra work upon the heart. Any increase in blood pressure, in some subjects, renders cerebral hemorrhage more probable, and, by throwing extra work upon the heart, functional failure may be induced. Patients suffering from advanced stages of such diseases, however, are not ordinarily dental subjects. Very much, if not all, depends upon the skill with which nitrous oxid and oxygen is administered. Finally, the aspiration of vomited material must not be wholly disregarded.

(2) and (3) Yes.

Sincerely yours.

The last two gentlemen, Drs. Connell and Coburn, are especially qualified to speak on this subject, having had a great deal of experience with anesthetics of various kinds, and lately having been doing a great deal of special work with nitrous oxid and oxygen.

SUMMARY.

I wish to take this opportunity to thank those who have so willingly and thoughtfully replied to the letter of inquiry sent. Judging from the proportion of answers received, this report is the most successful of any during the three years in which I have served as your Correspondent. Of eleven sent to dentists, eight replies were received, and

of eight letters sent to physicians, five replies were returned.

The letter from Dr. Hartzell is especially valuable, because of the detailed information it gives. There seems to be such a difference of opinion in regard to most of the questions that it would be difficult to attempt to condense them in such a manner as to draw any definite conclusion.

However, as nearly as I can judge from careful perusal, the majority seem to think that $N_2O + O$ is of benefit in quite a number of the very painful operations; that a capable assistant should be at hand if not actually needed; that special training is absolutely necessary for its safe administration; that ill-effects are produced in about 10 per cent. of the cases operated on, and that the apparatus should be in the offices of only those who are perfectly competent to use it intelligently. I would call special attention to the statement of Dr. Karl Connell, assistant surgeon at Roosevelt Hospital, New York, a man who has made a very special study of all anesthetics. He says that *"$N_2O + O$ in unskilled hands is more dangerous than either ether or chloroform."*

There are a few points, as yet not mentioned in the report, which I hope the discussion will bring out.

One, which it seems to me is very important, is the liability of cutting beyond the safety point while the patient is under analgesia, thus bringing about the subsequent death of the pulp.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

ANESTHESIA AND ITS RELATION TO OPERATIVE DENTISTRY.

By W. D. DELONG, D.D.S., Reading, Pa.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Philadelphia, Pa., June 30, 1914.)

BY virtue of discovery, Anesthesia is the historical property of the dental profession. The victory over prejudice, doubt, and opposition, which followed the introduction of this great boon to patients who had to submit to surgical operations, whether of a major or minor character, was obtained only after a hard-fought battle. In this fight the dental profession played no inconsiderable part. Time must not dim the glory of this discovery and conquest, nor detract from the honor of the discoverer and warriors. Horace Wells discovered surgical anesthesia. Morton discovered the anesthetic properties of sulfuric ether. Both these men were dentists. Their names should be forever enshrined upon the walls of the Hall of Fame.

TARDINESS OF THE DENTAL PROFESSION TO ADOPT ANESTHESIA.

Until the advent of analgesia, *i.e.* that condition in which the sense of pain is either partly or wholly obliterated while consciousness is retained, dentists, with comparatively few exceptions, did not avail themselves of the great service anesthetic agents are capable of rendering to patients.

In the past, many members of our profession had, and probably at present more still have, an aversion to the administration of anesthetics so as to produce complete anesthesia. This aversion had a twofold tendency—to create a class of specialists who became skilled in the administration of these agents, and second, to drive this part of practice

into the hands of advertisers and charlatans. The former effect of this aversion is a laudable one, while the latter is no small factor in the apparently large "business" done by the dental parlors and dental institutes of the country.

Nitrous oxid outfits, until recently, were found in relatively few dental offices, or, if installed, were shortly afterward discarded. Ether and chloroform were seldom administered by the dentist. For the extraction of teeth and an occasional minor operation in the oral cavity, where anesthesia was decided upon and the case was not sent to a specialist, a physician was called—and this is still the case—to administer the anesthetic.

Has this practice created and fostered the impression so prevalent in the public mind, and maybe in the medical mind as well, that the dentist is not as capable, by reason of lack of training and inexperience, as his brother, the medical practitioner, safely to induce anesthesia? Moreover, may I ask, Is there truth in this opinion which the public so largely entertains? Not everyone can be a skilled anesthetist. But surely there ought to be in every community one or more skilled dental anesthetists who could be called in case of necessity.

SKILL IN THE ADMINISTRATION OF ANESTHESIA A PARAMOUNT REQUISITE.

The introduction of the mixture of nitrous oxid and oxygen for the induction of anesthesia and analgesia in operative dental practice seems to have revived the interest of the dental profession in no small degree. According to a canvas of two hundred dental offices, over 37 per cent. are equipped with nitrous oxid outfits of the later models for the administration of nitrous oxid and oxygen combined. Manufacturers, aided by numerous members of the profession, are vying with each other in improving and perfecting apparatus, each manufacturer making great claims as to the superiority of his make of machine. We can rest satisfied that the ingenuity of dentists and manufacturers will sooner or later, and soon at the latest, produce the perfected machine; but we must not forget that no machine will ever take the place of the man, the operator, the anesthetist. Let not the perfection of the apparatus replace for one moment the necessary knowledge and skill. Sight and hearing, analysis, judgment, decision, and action enter into every act of inducing anesthesia. No inanimate object, however ingenious and perfect, can possess these functions. Anesthesia is no plaything. The *Medical Times,* a few years ago, said in an editorial: "The reason why the patient so rarely goes beyond the borderline lies not so much in the agent employed as in the skill of the experienced anesthetizer, who knows the properties of the drug he uses; who, after a thorough examination, has taken all precautions, who foresees all possible accidents; who will not trust to luck; and who remains vigilant throughout, and until the patient returns to consciousness." These requirements should not make the dentist shrink from the use of anesthetics, but be a stimulus to so inform and fit himself that he can take up the practice with confidence and skill.

INDICATIONS FOR NITROUS OXID AND OXYGEN ANESTHESIA.

While ether and chloroform have frequently been employed for difficult extractions and other operations requiring more than one or two minutes, the combination of nitrous oxid and oxygen administered by the nasal inhaler is less frequently used. What follows refers to nitrous oxid and oxygen anesthesia only.

Complete anesthesia is of great value in several operations other than extraction. In opening up a pulp chamber, when acute pericementitis is present—an operation which almost invariably is excruciatingly painful—most happy results are obtained, and the patient's blessing is bestowed upon the operator's head as part of the remuneration. In these cases, the patient after having suffered intensely for several hours, and

sometimes a whole night, is in a condition of fever and lowered vitality, if not slight shock. To submit him to the painful ordeal of drilling into a tooth so sore that the merest touch is almost unbearable, might be termed cruel, when in a few moments this operation can be done painlessly under the influence of nitrous oxid and oxygen anesthesia.

It is good surgery to thoroughly curet an infected alveolus immediately after extraction. It is remarkable that so little general infection follows the extraction of septic roots. Occasionally, however, we see no little trouble, local and systemic, as the result of an extension of an infection, or a reinfection; curetment under complete anesthesia will remove the foci of infection, and healthy granulation will follow. The opening of alveolar abscesses and the scaling of the roots of teeth affected with pericemental abscesses are other conditions where general anesthesia may be indicated, and where thorough work can be done by its employment. It is not the administration of nitrous oxid and oxygen for inducing complete anesthesia, however, that has caused the profession to receive the introduction of this combination so extensively and so enthusiastically in many quarters.

THE BENEFITS OF ANALGESIA.

Analgesia is a word of common occurrence in the dental literature of the last few years. Many means and methods have been employed in the past to relieve pain in cavity preparation, with but indifferent success. We all meet with cases where it is practically impossible to prepare a cavity according to our ideals without inflicting severe pain and the production of shock to the patient. Fortunately, in analgesia we have a means of combating both these effects in our operations upon patients of this type. The practitioner who has familiarized himself with this method of practice no longer dreads the appointments with this class of sufferers. "No more dread for the dental chair now!" was the exclamation of one of the writer's patients, after her teeth had been filled—while, before, temporizing only had been possible. This, I believe, is the experience of all users of the analgesic method.

Its benefits need argumentation no longer. It is the method *par excellence* in all cases where pain-elimination is indicated. It can be safely stated that when the operator has the confidence of the patient, and when the gases are properly administered, this condition of painlessness can be produced quickly and surely in practically every case with little or no bad after-effects.

DISCRETION ADVOCATED IN THE USE OF ANALGESIA.

In what per cent. of cases is the use of analgesia indicated in operative work? Here a great difference of opinion exists among practitioners. Some men recommend its employment in nearly all cases. In my own practice it is resorted to only occasionally, because I am not in harmony with what seems to be an indiscriminate use of the gases. Is the elimination of all pain in our dental operations desirable? May we not consider pain as a normal physiologic function serving a useful purpose even in the operation of preparing a cavity in a carious tooth? I quote from Dr. DeFord's book on "General Anesthetics in Dentistry" the following paragraph: "Bold in other directions, commendably progressive in all that relates to manipulative ability and artistic development, the dental surgeon shrinks from anesthetics. He cuts into living tissue, lacerating the nerves themselves, performing laparotomies upon the teeth, so to speak, and the anesthetic usually employed is that of witty speech or an amusing story, while the patient suffers, cringes, agonizes, almost to the state of collapse." Is this a picture common in your practice? If so, by all means employ analgesia! Much has been said about shock produced by pain inflicted during cavity preparation. It is a question, however, whether prolonged analgesia will not make a greater impression on the nerv-

ous system than the slight degree of pain which accompanies the larger number of operations upon the teeth. Therefore, just objection may be raised against the indiscriminate use of this agent.

A patient in a state of analgesia is not in a normal state. Some patients are very susceptible to the influence of the gases. It has an exhilarating effect upon them. The desire to inhale the gases grows upon them, and they ask for their administration when no painful operation is done. In such cases we should be careful not to create an appetite such as may result, because of our treatments, in other drug habits. Discrimination and discretion should be the watchwords to guide us in the use of analgesia, and we should shun the abuse of this most desirable aid in our work.

ETHICAL AND UNETHICAL PROPAGANDA FOR ANALGESIA.

A great deal of credit and gratitude is due to Hewitt, Teter, and others, for bringing the value and the method of the administration of a mixture of nitrous oxid and oxygen to the attention of the dental profession. Apparently, so the writer views it, manufacturers are making an undue and possibly harmful effort to introduce this practice into our offices, and so-called courses are being given in anesthesia and analgesia by itinerant teachers and lecturers. All of you have no doubt received circulars inviting you to take courses of instruction in the use and administration of nitrous oxid and oxygen analgesia. No valid objection can be found against this method of teaching, if it is done in a spirit of professional dignity and integrity. Some of the circulars sent out broadcast, however, savor very strongly of the commercial spirit; and this society, in the opinion of the writer, would do well to put its stamp of disapproval upon such conduct. Exaggerated claims are made, and the dollar mark seems branded upon most of the topics taught. Let us not be trapped by the transparent veil of professionalism that is intended to hide the true motive of pseudo-teachers. Increase of financial returns is the slogan with them. To receive a professional fee commensurate with the services rendered is strictly ethical. But to use a new apparatus, or a new method of practice, as a subterfuge to increase one's financial income is contemptible professional graft.

POSTGRADUATE INSTRUCTION IN ANALGESIA NEEDED.

Postgraduate instruction in the analgesic method of practice is needed, owing to the want of experience with anesthetics on the part of the majority of dentists. The relation of the dental profession to the supply houses is probably closer than any similar relation of the medical profession; yet it is hardly questionable, from a professional standpoint, whether these houses or depots are entitled to any teaching rights.

Reports have come to my notice where representatives of commercial houses not only have instructed practitioners in the use of the apparatus which they sold, but also taught them how to induce anesthesia. A week of clinical lectures in anesthesia and analgesia under the auspices of the State Society, local societies, and dental colleges in various cities of the state would supply this instruction in a manner not open to objections. Let every dental office be equipped with a gas outfit; let every dentist familiarize himself with the technique of its operation, and then apply it with intelligence, judgment, and professional honor—and our profession will have acquired a most valuable addition to its armamentarium.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

DENTAL EDUCATION.

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THE subject of dental education is not new. It has been brought to our attention so frequently that some of us would perhaps prefer a discussion of some interesting phase of dental practice, leaving the problems of the education of the dentist and management of the dental colleges to those few men now in charge of the work. It is because the schools need suggestions and help from the rank and file of the profession for the upbuilding and uplifting of the standards of dental education in this country that I present this subject at this time. There is no more vital question in all our modern complex civilization than that involved in the one word, Education. Institutions large and small, public and private, state and secular, are grappling with it as never before, and we, as dentists, if we would attain to the high professional standing in the community which we covet and which we have a right to expect, must in a large measure attain it by recruiting our ranks with graduates educated and trained in the best possible manner for their chosen field of work.

DEFINITION OF EDUCATION.

The chief object of this paper is to emphasize the value of proper education, hence a definition or meaning thereof should stand out before us throughout. Herbert Spencer defines it as follows:

"Education tells us in what way to treat the body; in what way to treat the mind; in what way to manage our affairs; in what way to bring up a family; in what way to behave as a citizen; in what way to utilize those sources of happiness which nature supplies; how to use all our faculties to the greatest advantage of ourselves and others; how to live completely. And this being the great thing needful for us to learn, is, by consequence, the great thing which education has to teach. To prepare us for complete living is the function which education has to discharge."

Our effort should be to function maximally in society; we should practice our profession as a duty toward humanity. All this involves responsibilities which extend in many directions.

The man who remains inactive in regard to state and social questions was referred to in early Greek society as harmless, but it was soon found that the adjective was inadequate, and henceforth he was referred to as useless. His life was too incomplete; he was not vitally interested in the world's improvement. What is this world and society to me? and, What am I to the world and society? are questions that every man should have before him, instead of the predominating materialistic substitute—which, simply stated, is only concerned with What can I get out of it?

BROAD INTERESTS A REQUISITE FOR EFFICIENCY.

Dentists should not consider themselves as separate from general activities. This is often an unfortunate accompaniment of specialization, and is more often true in those instances where the specialization was not preceded by a broad general education.

The present status of things should be vividly before us in whatever we do. Some knowledge of the aims and ideals of our age and of the country in which we live is not only interesting and illuminating, but is absolutely essential to

attain to the highest efficiency in our efforts in our various specialties. And it is not difficult to obtain this. We are perpetuating in slightly lesser degree pretty much the same traditions which have dominated and oppressed the world for centuries. Briefly stated, this is to ignore nature's essential demand upon us for "work," and as soon as possible to live without working, or simply to idle because somebody else works.

We strive to accumulate wealth of some kind, and there is no wealth which does not represent human labor;—ease and luxury on one side, and servitude on the other! It is either interest, rent, dividends, or some income from position without real work—and in all of this colossal material struggle we forget the human being and his rightful lot! We claim we are better off as a result of science and the application thereof, but has the result really been an increase in human welfare and happiness? It seems that the opposite is continually being emphasized; there is a wider gulf established between the profit-takers and the oppressed toilers. *We have entirely forgotten to aid humanity to do what nature seems to suggest all the time, namely, to become more and more perfect mentally and physically.*

This is our environment. Many of us never know any other aim than that which is predominant in the minds of the unthinking mass. We are not practicing dentistry because we find in it joyful expression, an ever-increasing satisfaction in realizing our ideals, and through this the greater vision of higher and higher possibilities, the infinite through the finite. It is a rather drowsy existence, which poisons our efforts, and real progress is almost hopeless. We want to be left alone in the pursuit of the lower ideals.

A nation is the sum-total expression of its individuals; no man lives alone; he contributes unconsciously to the group; so after all it is the individual character with which we are concerned. Henceforth, if the predominating aim is to accumulate wealth, we must ask how this leaven works and affects the various institutions, government, life, and activities of the people and the individual citizen. In other words, we must have a true perspective, a true understanding of what is and what is not, before we can functionate efficiently in the social structure. In this connection the educational forces are most important, especially those institutions which give the tone to the general education and atmosphere of the period.

UNIVERSITIES AS THE POTENTIAL STRONGHOLDS OF IDEALISM.

It is often said that universities establish the intellectual horizon of a given community. If they were left unhampered by the material forces of the particular community, they probably would soar to the highest star. Unfortunately, however, this ideal condition does not exist; more often we find that the prevailing or materialistic environment perpetuates its ideals through the educational avenues. This is never proclaimed, not even in a whisper. The audible remarks are chiefly in the direction of higher and greater attainments, blessings to the reaper, contentment, happiness, etc. Thus universities can be effective weapons in the propagation of ideals of whatever kind.

If education is the means by which we learn to adjust ourselves to the world, should it not be uncontaminated and untrammeled by the ideals of the materialistic and greedy elements? State universities usually reflect the ideals of the community; if the latter is democratic, we may find this ideal more or less realized, according to the sincerity, morality, and intelligence of the people. Privately endowed institutions are apt to be influenced by those who contribute to their maintenance. Nevertheless, it is to the universities that the world is most deeply indebted for its intellectual development. The universities have preserved the thought and knowledge of the past, and it is to these institutions that we look for education and guidance in all great movements. How well these institutions have accomplished their mis-

sion can best be studied by an examination of the results in the various regions—and be it also said that their influence is not only local. The universities are charged with a great public trust, hence a deep interest should be taken in them by all who are concerned with the perfection of man.

THE ULTIMATE AIM OF EDUCATION.

These institutions have stood for the higher things, although, for subtle reasons, they have not always emphasized certain items in some places. Generally, their aim is to develop normally all the faculties of man and point to the happiness which insures therefrom. An education should fit a man for complete living; he should be able to earn his own living, not be a drag to the community; furthermore he should be able to contribute something toward the perfection of the world. Again, if an education does not fit a man for the appreciation of the beautiful things of the earth, it is a failure; there must be something in the curriculum which will give him a vision, a presentiment and foretaste of higher destinies. There is nothing so sad in this world as a limited outlook; it antagonizes the very basis of organic life. It is therefore clear that a civilization which ignores that something which will carry the mind upward to the sublimest intellectual heights, as well as that fundamental principle of nature which demands work from all, must sooner or later disintegrate. The ideals of the nation must include the welfare of the largest number, a just social organization without slavery in any form; whenever this did not maintain in ancient democracies, they perished. It follows, then, that the government must not lend itself to any individual triumph which does not include the mental, moral, and physical well-being of all its people.

To realize one's self, to externalize the depths of one's soul or inner self, is the great aim of life. To the extent that the greatest number of individuals realize this, can a nation be called successful. We are indebted to the Greeks for that part of our training which developed the physical man or sound body as well as the intelligence, but it is in the Christian religion that we find duty toward our fellows emphasized; these influences have molded our educational systems rather effectively to the present day. We must also analyze the effects of modern science and industrialism. Perhaps other words could be used to bring out a discussion, such as individualism and its tendency, capitalism and its operations, etc.

PRESENT STAGNATION IN DENTISTRY.

The foregoing remarks ought to give us a perspective so that we can appreciate what may be the central conception which explains and justifies the movements of a given time in any special calling, such as dentistry. They cannot hang unsupported in the air; they must have support or root in some kind of soil, to be of permanent value in the great scheme of things. This is true in regard to dentistry. If it can prove its right to live with other useful and necessary pursuits, then it should show signs of life, like other living things, by sloughing off that which is useless and assimilating that which is new and useful; in other words, dental education must readjust itself to the ever-changing conditions of life and modern progress in general.

There has been no such response, and the present activities for better things seem somewhat stagnant, and remind us of a harmonious prelude to a future more quiet still, a sort of gentle preparation for disintegration. Of course, it must always be borne in mind that there are a few men in nearly every period of history who labor insistently for the higher things, and their work resists disintegration.

UNFITNESS OF MANY DENTAL STUDENTS.

One reason for this general stagnation is that we have had a rather spectacular dental educational performance in America for the last quarter of a century.

It has kept pace with the masquerade of other large carnal appeals to which the human family often responds. The product gives us a fair test of the work done by our schools. On discussing the product of our dental schools I know I shall be criticized. Yet it seems to me that a man who has observed carefully, with impartiality and objectivity, should give expression to his innermost thoughts on things as they are, as well as suggest some remedies. This partakes of constructive suggestion. No one can deny that the dental profession has a rather large number of unfit men in it, unfit because of a lack of special native talent or bent for this particular calling; these have drifted into dentistry as a result of improper vocational guidance or no guidance at all, save that limited vision of childhood which depicted the neighborhood dentist in all his glory. This, then, must be a defect partly chargeable to dentistry, since so many schools take all applicants, continue them whether unfit or fit, and finally graduate them. Being in the wrong occupation, the individual is of course unable to find expression, and is at war with himself; he keeps on drifting without a rudder. Life is unsatisfactory and meaningless; instead of harmony and unity we have chaos and disintegration. The suggestion of a readjustment to such a man is always resented; he has his investment, and according to the spirit of the times, it must be made to pay. To build up the future with such a man is more hopeless still; he is usually without any other vision than that supplied by the prevailing commercial atmosphere.

THE QUALITY OF MODERN DENTAL EDUCATION.

To the foregoing must be added the most important item of all, namely, the quality of the education itself. Let us pause for a few minutes to gather courage; we need it, because when it is keenly analyzed, there will be very little left of the whole business.

The early period of dental education. Organized dental education began with the first school about three-quarters of a century ago in this country; there was a desire for more systematic and effective teaching of dentistry than could be given under the direct tuitional system of office instruction. The medical schools at first refused to co-operate in this movement. It was a critical period, all told, because general education was about to pass from the old and more or less simple ways to meet newer and more complex demands; all this as a result of the ever-increasing industrial problems and material wealth. In the early days of the century our problems were not so intricate, and the education of that day was adequate for their solution.

Whatever general education was offered at that time, the special callings did not always demand very much preliminary work. Many good men were produced, however. It could not be otherwise in a new country where rapid changes took place, and where opportunities were freely open to talents waiting for expression. The educational systems of many technical schools of those days were more or less crude and somewhat superficial, owing to lack of funds and also to lack of real pedagogs, so the production of good men was probably due as much to the student's former preparation and native ability. Nevertheless, we can still respect this early period of dental education, because it was primarily a sincere effort. Our more recent development can be foreshadowed when we remember what has happened in the last forty years, socially, economically, politically, and otherwise. It was an age of intense industrial expansion, buried in material greed and exploitation; tremendous fortunes were made in brief periods of time; the earth was so easily skimmed, and often men succeeded with very superficial attainments. During this period capital was found for every enterprise conceivable, and furthermore there were no geographical limitations and gospel of humanity considered, or if there was some religion extant, it was not thoroughly applied to the trade operations of the time. It would be strange indeed if anything

could escape untarnished from such an atmosphere, but let us refer to this period as a temporary phase of our civilization—a period of strong, positive conditions with resulting negative relations—and eventually hope for readjustments to the nobler ideals of which we are capable.

Exploitation of dental schools for purely materialistic purposes. Dentistry came in for its share of exploitation. Schools were organized, factories sprang up, things (mere matter in the eyes of the exploiters and dictators) had to be marketed, and in this scramble the welfare of the people was forgotten and ignored. We were all so well fed we went to sleep, and from this sleep we have not even now half awakened. Students were enrolled and graduated by the hundreds—a college which could not boast of this quantity was not respected. Dental chairs and other equipment were produced in large quantities, and men had to be supplied to operate the equipment. Laws were modified by the dictators so that the whole should increase in value and profit. This was the chief consideration. The aim of the colleges was to attract students, and to this end as many modern weapons as possible were used. It was a rather easy field to plow; men of low commercial ideals were attracted to it more forcibly than those of spiritual power and genuine pedagogic ability. Students were regarded as impersonal things, like mere receptacles into which some superficial information was to be poured, rather than as living organisms, which having digested suitable food are stimulated into healthy activity. The whole process was unable to initiate mental activity. It was the aim of the promoters to perpetuate their ways. The subtle agencies resorted to for this nefarious business were often of a persuasive order, and the sleep of the rank and file was contributory to the perpetuation. It must also be noted, however, that the whole scheme of vocational education was somewhat chaotic in its makeup. To go into detail in regard to the curriculum would occupy much time; generally speaking, high ideals did not prevail in the large majority of dental schools, and what is worse, they do not prevail at the present time. Many of us do not appreciate the real conditions on account of nearness to the movement; we often require distance in time, to get at the real truth of things. In this instance we cannot allow this traditional principle to operate too much, because, in the meantime, a great deal of harm is and will be done to the whole population of this country as well as to others beyond our border.

Shortcomings of modern dental educational institutions. Educational institutions of the ideal modern, democratic type are endowed. Education, whether general or vocational, must be regarded as a serious thing in the life of a nation. When it degenerates into a money-making affair, an industry for profit solely, then it is unworthy of the good name which it so proudly uses, and the degree is a mockery. The scathing criticism of American dentistry in other lands must be recognized, and should be interpreted by us in a constructive sense, rather than resented with storm and indignation. It is undoubtedly true also that we can show a more perfect plant, but in the hustle and bustle of the circus-like performance of dentistry the slow and sincere reconstruction going on here and there is not noticed—it is not in the limelight. It behooves us as a profession to intensify ourselves in our investigation of what is really going on in our dental schools. It behooves us as a progressive, organized body to prove our right to such appellations, making stepping-stones of our dead selves, going on to something higher and better. However, we must not be forgetful of the few sincere and real benefactors of dentistry, and that many good all-around men have emerged from the system—but this is more like the lily growing out of the mud. And, indeed, we can acknowledge that some good shall come from the present makeshift—namely, that it shall act as a fertilizer for the growth of a better and larger body of men.

A BROADER AIM OF DENTAL EDUCATION WANTED.

There are simple duties of honesty and thoroughness in all work, and if education is the most serious item in the immortalization of a nation, we should apply our efforts to it first.

Our early educational efforts were directed toward making men of character and strength; men able to solve the problems of the day. As we have progressed, our problems have become more and more intricate, and the former education is inadequate; specialties are entered upon early, and the result has been a narrowing of the individual's outlook. The readjustment is slow, and the technical schools, dentistry included, are from the very nature of things consciously preserving the *status quo*. They are almost criminal in laying hold of anything that presents itself which will maintain them in the old routine. We must produce men capable of entering into the larger life of the community, men who can functionate maximally as citizens, because every man is responsible for the tone of the society in which he moves, and for the influence which he spreads around him, hour by hour. The future dentist must be able to live in the real interests of the day; he should have broad views upon the whole range of questions that are vital to the hour. The isolation of any man from these things make him a machine, an automaton, and an irresponsible being. This points to the fact already indicated, that a better preparation before entrance to the dental school is needed, as well as a thorough reconstruction of the curriculum and the methods of instruction. The dental teacher must be developed; state aid must be had to give financial support, as no college can adequately teach dentistry if it is obliged to work on a self-supporting basis. Let us again emphasize that perfection for man consists in the full development of all his forces, physical and intellectual, and of all his emotions, his family affections, his love of humanity and duties to his fellows, his sense of the beautiful in nature and art. And to this Dr. Babylon replies that dental schools *per se* are not concerned with anything but just the teaching of dentistry; and the same man keeps on shrinking in his dental ideals until the product is so withered that it reminds us of a huge tree gradually dying, branches falling, and the trunk yielding to decay from within and without.

DENTAL TEACHERS OF HIGHER IDEALS NEEDED.

Something can be done in all technical schools by way of establishing an atmosphere of a higher and more spiritual kind than these schools have hitherto been able to produce. We are influenced as much by the unconscious as by the conscious. But this requires a different order of teacher in the dental school than is generally employed; in many instances our dental teachers were experts in their specialties, and at the same time were totally lacking in the great human qualities, or as Bosanquet says—"A man may be a good doctor or a good painter, or a good engine-driver, and yet be a brute, a liar, or a cheat." Our first great step to remedy these many wrongs is to acknowledge the real condition, and the next genuinely to desire a betterment. We must get out of our narrow horizon, and insist that the entering portals of our profession shall give society the class of men who will perform rightfully and manfully the duties expected of them. There are too many machine men in our profession already, and these usually have no heart in their work. If they had had in all their preliminary training instilled into them the idea that we are all working together for the common good; if in the technical school this idea had prevailed in everything that was done, the product would be a class of men who would practice dentistry as a duty toward their fellows. Geo. H. Palmer says—"It is from the management and temper of a school that its formative influence proceeds." Buildings, chairs, and fountain cuspidors bound up with the capitalist

organization seeking to enlarge its dividends as the chief aim cannot produce great spiritual human beings who are interested and enthused in the common good of man. For this we need wise men of large social and altruistic selves, men who live and strive after an ideal. The teacher, the man, the leader, the organizer, who is in any way connected with our educational forces, must have the large human qualities and relationships, especially the man who works with the student daily.

It seems strange that in America, where we have really done so much for education, the vocational teacher is not yet to be had in sufficient numbers—our national neglect, of course. One of our faults is that we have been satisfied to practice dentistry as a trade, aiming largely at personal gain, and not as a profession, which is concerned with larger things. One attracts the materialist, the other the altruist. The dental teacher must in all probability be made; briefly summarized, he should teach because he loves it, should find expression in service, should intuitively adjust himself to others, and especially to the student mind. He should grow larger and wealthier year by year through contact with the spiritual possession of the world; this expands his personality and enriches his experiences. These accumulations are reinterpreted through him, and applied unconsciously to the work in hand. The ideal teacher uses the thought of the world at the bench, wherever it is; he must be a resourceful man, always ready with a chest full of great and stimulating ideals to connect with the concrete work, in order to prevent the narrowing tendency of a specialty. He should at all times watch his pupils and prevent them from becoming mere recipients of facts; he should arrange his work so that the students are continually grasping the abstract through the concrete—this enlarges the mind. We are often criticized for a lack of ethics—this must be recognized by the teacher, and unconsciously and yet concretely he can encourage the development of the moral habit. On this point I want to quote G. H. Palmer,* who emphasizes the value of human relationship as follows: "As human beings, however, pupil and teacher are akin and removed from one another merely by the degree of progress made by the elder along a common path. Here, then, the relation is one of fellowship, but a fellowship where the younger is largely dependent on the older for an understanding of what he should be. By example, friendship, and personal influence a teacher is certain to affect for good or ill every member of his school. In any account of the school as an ethical instrument, this subtlest of its moral agencies deserves careful analysis."

It is the teaching by example that is so powerful in many instances; the teacher must be instinctively good, and not a classroom sham. "When good has been clearly perceived, it never abandons the mind." I have forgotten who spoke these words, but the truth of them tenaciously remains in my memory. And we must go still farther. The teacher must look upon life as the great expression; he must look upon dentistry as a connecting link in the realization of our true selves. From the very inherent characteristics of the present system, this sort of teacher could not be produced; he simply cannot grow in the trade environment.

ESTABLISHMENT OF STATE UNIVERSITY DENTAL SCHOOLS ADVOCATED.

This means first, then, that we must demand the establishment of state university dental schools, and encourage them wherever they are. The universities need your constructive criticism and moral support; they need to be dealt with equally with other callings under state supervision. Furthermore, the situation is not hopeless in regard to the ideal teacher; we have him, but at present he is not allowed to expand or evolve

* G. H. Palmer, "The Teacher."

to ripeness. In the proper environment, plants yield the greatest fruitage. The dental teacher, like other vocational teachers, must be chosen, first, because he is efficiently equipped in his vocation, then according to his aptitude for teaching, and last, but not least, according to his cultural and spiritual attainments. The latter may come, after the first two important requirements have been met. In no case should a teacher be allowed to go on, however, without the third or last requirement. It is the larger and nobler life we want to emphasize in the future, and this is obtainable through literature and art. We have had too much of Dr. Babylon, whose life has exaggerated the importance of material conditions. It is bread and butter with Dr. Babylon. If his technique is good and brings a bellyful of food with it, that is the end of things, as far as he is concerned. But there are other aims which intensify the hopes and preferences of man, which mean greater human happiness, and all of these were not included by the pompous Dr. Babylon in his considerations. Shall we allow the latter with his pinching and materialistic views to hamper the true progress of dentistry? We have difficulties to overcome in trying to get state aid. Dr. Babylon will prevent the establishment of state schools; they yield him no direct profit. He will discourage the development of the ideal teacher, the greatest leaven of our future work. He will dictate our standards to us through legislative bodies; he will control our society expression and effectiveness by the use of many subtle weapons. All of his work will easily be seen through, when the greater spirit of the rank and file has been aroused; the latter we depend upon for constructive action.

CONCLUSION.

To sum up, it seems to me that education, the greatest and noblest of all missions, cannot be intrusted to the "industry for profit"* element. We must use our most united effort to have the state universities take over all dental education, but not on a niggardly basis. This is the first and most important step; this in itself will insure the balance, the development of the ideal dental teacher as pictured. Better methods of instruction, higher standards of entrance and fitness of students will soon come thereafter. The state can, according to its interpretation of community welfare, adjust the length and intensity of the course, and insist upon ideals and standards to be legally maintained.

We must strive eventually for a more general realization of the fact that dentistry is a great boon to mankind, and that it is intimately connected with general happiness. Furthermore, we must increase the possibilities for the man who enters our ranks to find joyful expression in dentistry.

Let me conclude by saying optimistically, and with all the enthusiasm that I possess, that it is the rank and file we depend upon. No reform ever comes from above. Dr. Babylon is the self-satisfied and contented drag to real progress; he has directed the whole movement. We have been turned from the true path of our development by the insincere pursuit of what was foreign to our temper, but our great hope is that, by sincerely desiring it, we may be restored to that dignified and exalted position which it is our birthright to hold.

* Expression used by J. H. Henderson in his book "Pay Day."

SURGICAL LESIONS DUE TO ORAL SEPSIS, AND THEIR TREATMENT.

By W. J. ROE, M.D., D.D.S., Philadelphia, Pa.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Philadelphia, June 30, 1914.)

THE term *sepsis* is here used in its widest application, and includes so many surgical lesions that a textbook could be written upon the subject. It is evidently impossible, within the space allotted, to attempt a connected and detailed presentation of this subject. The title of the paper does not necessarily include the etiology, symptomatology, or diagnosis of these surgical lesions, and I shall but briefly mention them and offer some suggestions in regard to treatment which, I believe, are not generally applied in practice.

PYOGENIC AND SAPROPHYTIC INFECTIONS.

The following lesions represent the earlier stages and manifestations of pyogenic and saprophytic infections, with their toxins and ptomain poisoning: Cellulitis, myositis, ductitis, lymphangitis, adenitis, periosteitis, osteitis, resulting in resolution or suppuration, abscess, and necrosis, and occasionally in sapremia, septicemia, or pyemia.

These are lesions due to pyogenic or saprophytic infection, or both. When they are of pyogenic origin alone, the clinical symptoms are invariably less severe or fulminating than when saprophytic infection is added. Saprophytic infection is necessarily secondary to pyogenic infection or devitalization from other causes.

The specialized lesions are so numerous that to mention the more frequent will suffice: Cellulitis of the lips, cheek, soft palate, floor of the mouth, tongue, fauces, and palatal pillars, the tonsils, and often extending widely, causing myositis of the muscles of mastication, expression, speech, and deglutition.

The salivary glands and their ducts are frequently involved by contiguity with the cellulitis, and rarely by continuity along their ducts and tributaries, except in prolonged and exhausting illness where the secretion is much altered or reduced, causing ductitis and parotitis, submaxillaritis or sublinguitis—which, in these cases, develop suppuration, abscess, and frequently septicemia and pyemia.

SUPPURATIVE LESIONS.

If the normal and acquired resistance of the tissue cells and fluids is not sufficently strong to destroy the invading bacteria and their products, then suppuration in its common acceptance occurs, with accumulating products in local areas, known as abscesses, or in wider areas, called suppurative cellulitis.

The specialized lesions due to suppuration are also numerous, the more frequent being alveolar abscess, ossifluent abscess of the maxillary bones, abscess of the floor of the mouth, superficial and deep cervical abscess, and are frequently further distinguished by the cervical triangle in which the suppuration is developing, such as a deep cervical abscess in the submaxillary triangle, or a superficial cervical abscess in the submental triangle, or abscess of the lip and cheek.

Lymphangitis is not often recognized, owing to the thickness of the skin and fascia, but the lymphadenitis is easily recognized, especially early, before much

cellulitis or the induration of a rapidly forming periadenitis develops.

Periosteitis may extend equally in each direction, but it rarely extends beyond the midline of the maxillary bones in unilateral infection. It is necessarily associated with some degree of osteitis and cellulitis, and when it involves the periosteum of the angle and ramus of the mandible, myositis is frequently a prominent symptom. Also arthritis and synovitis of the temporomaxillary articulation in some degree is usually present.

Osteitis refers to the maxillary bones, as they contain only red bone marrow; the term osteomyelitis I prefer reserving for the bones containing both red and white bone marrow. It is practically always secondary to periosteitis, and invariably begins in the alveolar process, reaching the body of the bone by continuity; as in periosteitis, it rarely involves the opposite maxilla or half of the mandible in unilateral infection.

PREVENTABLE LESIONS DUE TO ORAL SEPSIS.

The surgical lesions due to oral sepsis are practically all preventable, and therefore prophylactic measures are of first importance. With the intelligent co-operation of the patient, this should be the ideal of the dentist and patient alike. Such results are in the majority of cases obtained even now if the patients co-operate, but the increase should be continuous until practically all obtain the same protection.

The ideal or standard which I would place before the profession and public would be normal occlusion, with early repair of caries maintaining the early vital forces of the dental organs, and the prophylactic remedial treatment of pyorrhea alveolaris or extraction, if results are not preventive of infection.

INFECTIONS INCIDENT TO ERUPTION OR CARIES OF DECIDUOUS TEETH.

This, therefore, requires the dentist to assume full care of the dental organs during the lifetime of the patient. The infection incident to the eruption of the deciduous teeth is very frequent and severe in results. It is due, as in the eruption of the permanent teeth, to the invasion of the space between the crown and gum tissue by pathogenic bacteria, which are introduced with the food and salivary secretion, and being retained, develop and produce infection. This occurs more frequently during the eruption of the deciduous teeth than of the permanent teeth, with the exception of the third molars. The early and careful artificial eruption of these teeth by the excision of a quadrangular section of the gum, providing a self-cleansing surface of the crown during the inflammatory stage, will prevent pyogenic infection very largely, and also probably pathogenic infection such as tuberculosis of the regional cervical glands.

Tuberculous cervical lymphadenitis is more frequent during the first five years than at any subsequent similar period, and when it involves the regional glands which are primarily supplied by the tributary lymphatic vessels from the alveolar regions, the portal of entry for the invading tubercle bacilli is provided by the previous lesions of the gums or those produced by caries of the deciduous teeth. The same assiduous care in repair of the deciduous teeth, to preserve their vital forces, is necessary to prevent infection if for no other reason—which of course is obvious.

One of the important functions of the deciduous teeth concerns the normal occlusion of their successors, but if they are allowed to be destroyed by caries and become devitalized or necrotic, the question arises as to whether they are to be maintained at the probable risk of infection, in order to maintain or promote normal occlusion in the permanent teeth.

The dentist is then called upon to decide which is the greater evil, infection, which is so frequent in such cases, with all its serious possibilities, or the possibility of disturbed occlusion of the succeeding teeth and its consequences. From what I have seen of both condi-

tions, I am persuaded strongly that the danger of infection is greater, and I feel it my duty to advise extraction, notwithstanding the frequent objection of the dentist or orthodontist.

CONTRA-INDICATIONS TO EXTRACTION OF LOWER THIRD MOLARS.

The same watchful care is necessary during the eruption of the permanent teeth, especially the molars, owing to the extent of masticating surface which is to be uncovered before the danger of infection is passed. The position of the lower third molars is frequently such that, although they are in normal position and have advanced to the level of the occlusion of the second molars, they are only partially erupted, and remain so for long periods, causing frequent infection. These normal and useful teeth are frequently sacrificed by extraction, in the belief that their removal is necessary to relieve the infection, when all that was necessary and proper was the uncovering of the crown.

Not only are these third molars very commonly ruthlessly extracted, but the often severe traumatism to the soft tissues and exposure of otherwise uninvolved bone and periosteum invites and promotes a severe and extensive infection. The only cases in which the removal of these teeth is justified are those of malposition that cannot be corrected by ordinary means. I have yet to see a single case of an unerupted tooth in normal or malposed position causing any clinical symptoms, either local or reflex, until the tissues by which it was surrounded had become infected and inflamed. It is not the presence of the tooth, but the occurrence of infection, that produces the untoward result. Unerupted malposed or impacted teeth deeply protected in the maxillary bones, when discovered by the Roentgen rays, do not call for removal unless they be invaded by infection. The extraction of such teeth, for the supposed benefit to the patient, is often a serious expenditure of energy to him, while in reality only some necessary treatment is required for relief.

AVOIDANCE OF TRAUMATISM AND INFECTION IN EXTRACTIONS URGED.

In general surgery we have come to recognize the urgent necessity of performing every operation with the greatest gentleness, avoiding every possible traumatism, in order to conserve the vital energy of the patient, prevent infection, and promote repair. The same principle applies to oral surgery with equal or even greater force. In the extraction of teeth, great care should be exercised to prevent as far as possible all traumatism to the gum tissue, periosteum, or bone. This is necessary to limit infection and promote repair, to conserve the tissue for future function, to shorten convalescence, and thereby to lessen the waste of vital energy. The present methods are questionable in several ways, which I think it prudent to call attention to. When a patient has to have several teeth or roots extracted, and only one or two of these are infected and give trouble, the extractor should make it his practice to remove at the first sitting only the infected teeth or roots, and the others at a subsequent sitting, when the danger of infection to the periosteum and bone of these teeth is reduced to a minimum.

Many dentists have the careless practice of extracting indiscriminately teeth with severe infections as well as those which are practically free from infection at one and the same time, and of making the operations with the same forceps, thereby inoculating otherwise healthy portions of the mucous membrane and gum tissues. In order to avoid these surgical lesions or infections, it is necessary, I contend, to extract at one time, only the infected teeth or roots, and to remove the other teeth or roots at a time when the infection has been overcome, and the mouth is in a hygienic condition. If one is compelled to extract all of the teeth, infected or not, at one time, the non-infected ones should be first extracted, while the forceps are clean; or even better, a different and fresh pair of forceps should be used for each tooth. Then, before the infected

teeth are removed, the alveoli of the extracted healthy teeth are protected, temporarily at least, from gross contamination and rapid dissemination of pus and fluids which invariably follow the removal of badly infected teeth. While I do not want to appear as an alarmist, I want to call attention to the danger of the present method of extracting teeth. My first experience in dentistry was gained under a preceptor in Canada, whose practice it was to separate the gum tissue from all the teeth to be extracted, and then very carefully to loosen the teeth and remove them, leaving no laceration whatever, but clean, healthy sockets. At the present time, the habit is—and it is often a habit among those considered to be expert extractors—to see how many teeth one can tear out of the mouth in the shortest period of time. That, to my mind, is absolutely wrong. The expert extractor of today should remove teeth with the least possible traumatism, avoiding what would otherwise naturally and inevitably result in a grosser infection. There is no one factor, in my opinion, that tends so much to prevent infection of the gum tissue and alveolar process, and often the body of the bone, as careful application of the forceps and careful dislodgment and removal of the tooth. I have seen some of the worst infections in mouths in which the evidence showed that the gum tissue was torn and the alveolar process destroyed as the result of traumatism from the extracting forceps. I have thought a good deal of this wholesale butchery in the extraction of teeth, and have seen much of it. Instead of trying to extract the greatest possible number of teeth under one administration of the anesthetic, which attempt is inevitably followed by serious traumatism and infection, it would be much safer to administer the anesthetic several times, and extract the teeth at different sittings. If it is necessary to extract several teeth at one sitting, the gum tissue should be very carefully detached and the teeth carefully removed without laceration or damage to the surrounding tissues or the alveoli.

TREATMENT OF MAXILLARY SINUSITIS.

In concluding, I wish to speak very briefly of the treatment of maxillary sinus infection. Contrary to the opinion of many, I believe that the greater majority of infections of the maxillary sinus are secondary to infections adjacent to the apical portion of the roots of teeth. This, I believe, is much more common than any of us probably appreciate. Many of the infections following the perforation of the floor of the maxillary sinus become spontaneously cured almost synchronously with the treatment instituted within the root-canal, the natural drainage through the ostium being quite sufficient to cause the sinus to clear up. Further, I believe that practically all cases of chronic empyema, myxomatous degenerations of the mucous membrane, and polypoid excrescences that fill up the spaces in the maxillary sinus, are practically all due to the continual pouring-in of pus products through the alveolus, and these cases can practically all be sufficiently treated by good root-canal work, which will prevent further pouring-in of the pus through the floor of the maxillary sinus. When this is done the normal recuperative power of the tissues will clear up the infection in a few days. It is different, however, with chronic suppurative antritis. No drainage of any kind through the root-canal or alveolar process will suffice to cure these cases. The diseased membrane has to be removed from the whole maxillary sinus, which, during the formation of new mucous membrane, must be tamponed to maintain a reasonable amount of pressure. This treatment, in my opinion, should be applied only through the outer wall of the maxillary sinus over the anterior teeth which are in relation to the sinus; we know that the maxillary sinus rarely extends anteriorly to the first bicuspids, and practically never reaches the region of the canine, but in a large number of cases is in relation to the molars. Dr. Davis, of this city, has recently shown conclusively, in a series of splendid experiments, that the floor of the maxil-

lary sinus at about eight years of age is on a level with the floor of the nasal cavity, and previous to that time is on a higher plane, probably five millimeters above the floor of the nasal cavity, but in later years a great deal lower.

I am opposed to any method or operative treatment by which the maxillary sinus is made to drain through the nasal wall. I know this to be considered as good practice by laryngologists and nasal specialists, but I have witnessed many unpleasant and unfortunate results in cases where the nasal wall had been opened too extensively, so that the secretions of the nasal cavity had flowed into the maxillary sinus for months and years and had to be removed mechanically, the sinus becoming a receptacle for all kinds of secretions, pus, and débris which collects on the nasal mucous membrane. Such practice I cannot but denounce. The proper and to my mind conservative treatment consists in opening the outer wall through the buccal cavity, curetting away entirely the diseased mucous membrane and tamponing the cavity with iodoform gauze. If this treatment is instituted, and the tampon is renewed every three or four days, new mucous membrane will re-form in the course of three or four weeks, when the tamponing can be discontinued; in nine out of ten cases the opening will close spontaneously, and recurrence of the trouble rarely occurs.

THE NORMAL FUNCTION OF THE CHILD DENTURE IN ITS RELATION TO DEVELOPMENT OF THE JAWS AND OTHER FACIAL BONES AND THE PRESERVATION OF THE TEETH.

By H. E. KELSEY, D.D.S., Baltimore, Md.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Philadelphia, June 30, 1914.)

THE subject of the care of children's teeth, in its most obvious aspects, has been receiving so much attention as to make further elaboration superfluous. That phase of the subject, however, which is indicated in the title of this paper seemed to me worthy of further consideration, relating as it does to nature's own methods for establishing and maintaining the health and usefulness of the organs, and through them contributing to the health of the individual.

VALUE OF HYGIENE MEASURES.

I do not in the least degree mean to minimize the value or importance of all the artificial hygienic measures which have been so ably set forth in the many papers that have been presented and through the oral hygiene movement which has been so justly attracting the attention of both the profession and the public generally, for they are absolutely necessary to the civilized individual in proportion to the degree to which he has been allowed or encouraged to depart from nature's physical processes in the preparation of the food for the stomach; or to express this idea in another way, in proportion to the degree to which food has been premasticated before being taken into the mouth, thus eliminating the function of mastication and insalivation, which maintains not only in this

way its health and cleanliness, but as well prepares the food in the only proper way for the further digestive processes—for by this natural retention of the food in the mouth, together with the natural act of mastication, is produced the first of that sequence of secretory stimulations which provides in advance each division of the digestive tract with the proper ferments to take care of the particular kind of food which has been received at its beginning.

If we lived in an absolute state of nature, none of these artificial means would be necessary to the maintenance of perfect health. But we do not so live, nor is it necessary to do so to enjoy good health, for we can employ these artificial hygienic measures as adjuncts to nature's fundamental physical processes; yet we cannot interfere too radically with those fundamental physical processes without interfering with development, and therefore health; and of all our physical organs we have interfered with the functions of none so much—especially in childhood—as with those of the dental organs, and of them all none are of greater importance to the individual's health.

IMPORTANCE OF FUNCTIONAL ACTIVITY OF THE MASTICATORY APPARATUS.

It is strange but true that the acquisition of a certain amount of definite scientific knowledge relating to the nutrition of the body should have led us into a grave error regarding the manner in which that nutrition should be administered, apparently on the assumption that, if we were smart enough to discover something of the manner in which the invisible stomach performed its work and what food was most suitable for it, we could afford to ignore the mouth function in the preparation of that food for assimilation, substituting instead artificial comminution, especially in the child; for it was probably argued that, as he is so weak in many other ways in comparison with an adult, he must also be weak and inefficient in the use of his digestive apparatus, and especially that part of it which is under voluntary muscular control, the mouth. Then, too, the opinion has always seemed to prevail that the mouth was merely an orifice through which food might be introduced into the stomach, and that the teeth and mastication were only designed by nature to comminute the food sufficiently to permit of its being swallowed, ignoring insalivation, reflex secretory stimulation, etc. Acting on this hypothesis, it is not surprising that, in this age of machinery, it was decided that no matter if adults were usually able to masticate their food sufficiently not only to extract some pleasure from its flavor, but also to make swallowing a safe and practicable operation, at least no chances should be taken with children; and we all know the parental fear of choking which does not permit the baby to have the much-coveted bone to gnaw, or solid food upon which to exercise and stimulate its jaws and teeth and the structures in which the teeth are implanted. What was the use, they argued, of risking the child's life by allowing it to attempt to reduce its food by mastication to a swallowing consistence, when we have at our command such ingenious machinery for pulverizing anything from wheat to meat, or extracting its essence, which might be diluted with water? In fact, so great is the misconception regarding the use of the teeth that many people believe that they are thus preserving the teeth to longer life and greater beauty, not realizing that one year of vigorous chewing is worth more to a child than many tooth-brushes.

Fortunately, we have in the last ten years, through the careful study and research of a great many thoughtful men who have been studying the problem of nutrition from the mouth toward the stomach and intestines, instead of from the intestines and stomach toward the mouth, acquired a better understanding of this complex process, so that we now know the function of the mouth to be as important, if not more so, than that

of any succeeding organ, inasmuch as it initiates that sequence of secretory stimulations which, as before mentioned, is so necessary to normal digestion and assimilation.

As a matter of fact, while a child at birth is a helpless little mass of humanity so far as locomotion is concerned, it has nevertheless certain well-developed muscles which are associated with the function of nutrition, and which enable it to extract its natural food from the breast with as much tireless energy as it will ever exhibit later in life in any other capacity. And during this period of its life, it never suffers lack of development in the oral region if fed in the natural way.

By the time, then, that a child has reached an age when it exhibits an instinctive tendency to begin to take food other than milk and in a manner other than by sucking, it should have become manifest to its parents that nature's methods should be continued in its feeding, and that as teeth have been provided, the child should be allowed and encouraged to use them.

Among most mammals—and there is no reason why the human race should be an exception—there is a period during which the young take both milk and solid food, their size gradually making the supply of milk no longer adequate for their needs, even did not nature, after a certain time, begin to diminish the supply of milk preparatory to casting the new creature upon its own resources. And it is during this period that its instinct to reduce solid food by long mastication and mixing with saliva to almost the consistence of the liquid milk to which it has been accustomed is strengthened into a habit, and thus the inclination to masticate properly is acquired and fixed so that it will not be lost later. It is the writer's conviction, supported by such investigation as he has so far made, that if the habit it not formed at this time, it will never, or only in rare instances, be acquired later in life by a mere exercise of the will through the individual's knowledge that it is good for him.

TESTS REGARDING THE HABIT OF FOOD-BOLTING.

Some very interesting and instructive experiments were reported by Dr. H. C. Ferris before the Eastern Association of the Graduates of the Angle School regarding what he calls food-bolters. After experiencing the difficulty—which we all encounter in trying to secure reliable data—as to whether or not his patients properly masticated their food, he argued that a person who could readily swallow an object similar to a large pill without chewing could and would swallow his food in large and unchewed pieces. He therefore had six sizes of chocolate-coated bread pills made which he would instruct his patients to swallow, and the results showed that, while some could not swallow without chewing even the smallest, others could without the least difficulty swallow the largest, which was about three-eighth inch in diameter. On the face of it this experiment would seem to prove without further investigation that his hypothesis was correct, but Dr. Ferris supplemented it with the best information he could get on the habits of the patients subjected to this test, which all tended to confirm it.

When the writer heard Dr. Ferris' report he commended the work, but since making a more detailed study of this subject, he believes that its benefits were not by any means fully appreciated, and now thinks that it may become a diagnostic aid of much value not only to the dentist and orthodontist, but also to other specialists by furnishing a reliable index to the habits of a patient in this respect.

FUNCTIONAL ACTIVITY OF THE JAWS IN CHILDREN A PREVENTIVE OF MALOCCLUSION AND DENTAL CARIES.

A consideration of the mode of life of primitive races furnishes further evidence that the habit and inclination to masticate thoroughly before swallowing is acquired in childhood, and begun almost in infancy. Dr. Hrdlicka, curator

of the division of physical anthropology of the United States National Museum at Washington, states that among the Indians as well as other primitive peoples, children are given solid food as soon as they show a desire for it, and therefore at a much earlier age than our children, so that from infancy the jaws are receiving their natural developmental stimulus through the action of the muscles upon them. On the other hand, breast feeding is continued to a much later period than among more civilized races, so that the child receives abundantly those natural activating food properties which are so essential to normal development, and which cannot be provided in any artificial food, and at the same time it is acquiring the ability to prepare other food properly for digestion when the parent milk food is entirely discontinued. It is significant too that among primitive races, after breast feeding is stopped, the child must rely solely upon this acquired ability, for he is not furnished with the cows' milk substitute as are the children of civilized parents, and Dr. Hrdlicka also states that, during his observations of children among the Indians, except in some modern boarding schools, he found malocclusion and caries of the teeth so rare as to be really negligible, and I think we may reasonably assume that this is due in a great measure to functional activity of the jaws.

INCREASING REFINEMENT OF FLOUR AND ITS DELETERIOUS EFFECT.

Let us compare, for example, the manner of preparing corn for use as a food, which is an article common to both the civilized and the primitive child. In the case of the primitive child, the corn is prepared in two ways, one of which is by pounding it in a stone mortar into a coarse meal, after which it is made into cakes; the other consists simply in parching it, leaving the entire act of pulverization to the teeth—and what better mill could be devised for the needs of one individual than the magnificent dentures found in the skulls of the original inhabitants of this country and in the mouths of their descendants today, especially when they live under natural conditions?

Dr. Hrdlicka speaks of trips of several days' duration made with Indians, during which almost the only food was parched corn, and of which, under those conditions, he himself tired less than of canned foods.

The writer, during his childhood spent in the mountains of North Carolina, was particularly fond of the parched mountain corn—which, by the way, was neither sweet corn nor the large yellow corn of the North and West, but a much smaller white variety, doubtless much nearer to the original maize of the Indians, and which was at that time, when ground into a coarse meal in the little water mills of the country, the chief and almost the only material for making bread.

But this is much changed, and the introduction and use of the fine-bolted wheat flour now common is no doubt to the great detriment of the masticatory organs, if not in other ways. On the other hand, the child of civilization living in what is known as modern or up-to-date environment, instead of having to eat his corn parched, has a new kind propagated for him that will pop open and become soft so that little chewing is required, or it may be rolled into flakes and soaked in milk, or else it will be ground to finest flour, cooked into mush and eaten with milk or butter, or if it is to be made into bread, it will be mixed with other finely ground flour and so prepared that still little or no chewing will be required. What is true of corn is true of meat and all other articles of food that are common to both primitive and civilized man.

ERRORS IN MODERN CHILD DIET.

The sedulous care which civilized parents exercise over the diet of their offspring is commendable in so far as it does not interfere with, or tend to alter, nature's methods; but usually it does this—often even in infancy, and more

frequently from then to maturity. As mentioned previously, the fact that a child will occasionally choke, or, if left to its own devices, will choose food that will make it ill, is undoubtedly one of the reasons why parents get the notion that anything the child wants to do regarding its feeding must of necessity be wrong, and most of its instincts come to be regarded with suspicion.

A very scientific and in other respects excellent mother who had brought her child for the treatment of a malocclusion, when told that the child had not too many teeth, as she had supposed, but that its jaw had failed to develop sufficiently to accommodate them, said that this was very discouraging, since, if she had been conscientious about one thing more than another, it had been the nutrition of her child; then recounted an excellent diet, so far as materials went, which she had supervised for it since breast feeding—the only natural feeding, by the way, it had ever received. The list contained the usual fruit juices and but little fruit, beef juice but hardly any beef, and then only when it had been ground, and the same was true of other meats; milk and prepared cereals were important items, and some special child's food taken with milk was used for a time. A number of always fresh vegetables were also on the list, but nothing at any time to stimulate really effective chewing. I told her that she had undoubtedly furnished the child with sufficient nourishing food, but that, in attempting to supplant nature in the preparation thereof she had defeated both her own and nature's ends. Through lack of function, the jaws and all associated structures had failed to develop, and nutrition had been below normal in spite of the excellent food, because the first important digestive process had been neglected. At the same time, this mother recognized the necessity for the general exercise of the body and limbs, and had insisted that the child should have plenty of it. How strange that she, like so many others, should not be able to carry her understanding a little farther, and realize that one organ just as much as another must have functional exercise to insure development.

This case seems to me typical of a majority of those met with in the ordinary course of the dentist's and orthodontist's practice, while there are many others in which the child would be permitted to chew, but owing to some defect in one or more teeth cannot do so with comfort, and is therefore worse off than the former, in that its food has neither natural nor artificial comminution.

Finally, there are some who supply a wholesome common-sense diet for their children, and not only permit but encourage them to chew their food well. This, if applied to the whole race, while it might not eliminate malocclusion and caries, because there are other definite factors concerned in the etiology of these disturbances, would nevertheless greatly diminish them.

CONCLUSION.

This is not a paper on Fletcherism, which has been so often and so ably expounded, and which means proper preparation of food by mastication for further digestion, whether it requires ten minutes per mouthful for the dental cripple, or only twenty or thirty seconds for the individual with a good masticating apparatus.

The mouth-hygiene movement, if broadened to include a popular knowledge of the foregoing facts, will do much within the next few years toward enlightening the public generally; but are we as a profession exerting ourselves sufficiently to instruct our patients with whom we come in daily contact along these lines?

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE TECHNIQUE AND RELATIVE VALUE OF GOLD FILLINGS AND INLAYS.

By J. V. CONZETT, D.D.S., Dubuque, Ia.

(Read before the Dental Society of the State of New York, at its annual meeting, Albany, May 14, 1914.)

A DISCUSSION of the subject of the comparative value and technique of the gold filling and the gold inlay is both timely and profitable. The gold inlay has been in the hands of the profession long enough to allow of some definite judgment of its value as a preservative of the dental organs when used as a filling material.

When the cast gold inlay was first given to the profession it was hailed with delight, and a stampede ensued for machines with which to make it. Conservative men of the profession predicted disaster and went as far as saying that the method had no merit of permanent value. Others of equally high standing were loud in their assertions that the ideal method of the restoration of lost tooth tissue with gold had come. Today we again find an alinement of the operators of our profession for and against the gold inlay, and now their arguments are not *à priori* but *à posteriori,* for we are in possession of the results of six years of trial. There have been failures, multitudes of them, and we shall try, within the brief space of time allotted, to draw some conclusions from the failures that we have observed, and see whether they militate against the method itself, or whether they have been the result of a failure properly to grasp the fundamental principles upon which the inlay system rests, or to apply them if understood.

GOLD FOIL FILLINGS.

First let us take a hasty survey of the method of filling cavities with gold foil. Ever since dentistry has been a profession, the ability to fill a tooth properly with gold foil has been the measure of an operator's professional standing, and all dentists have been ambitious to excel along that particular line. Down through the ages of dental development, operator after operator has bequeathed to the profession some improvement in the methods of cavity preparation, the making and the use of the gold foil, the instruments, and the methods for the better and easier use of this king of filling materials. The method as used by the best operators of the present time is not the work of any one man or set of men; it is the result of the evolution of the art as it has been developed in the brains and by the hands of earnest, devoted men in all parts of the dental world; but it remained for one man of great genius and indefatigable energy to collect, harmonize, eliminate, and add to the methods of the best men of all time and then give to the world of operative dentistry that which his admirers have been pleased to call the "Black system." Dr. Black does not claim originality in the methods he teaches, and all that we will claim today is that he developed a system with which we may work to better advantage.

Those of us who ardently admire and love him, as I confess to do, are not content to give him so small a part, but for the sake of the advancement of the profession, and for harmony, we are willing to lay aside our personal opinions and work in harmony with anybody who is willing to take the good, come from where it may, and eliminate the bad, come from where it may.

THE BLACK SYSTEM OF CAVITY PREPARATION.

The Black system of cavity preparation teaches certain definite measures of procedure, each step having a logical reason for its existence. After a study of the case under consideration, and when ready to begin our cavity preparation, we follow this plan: First, obtain the outline form. Second, the resistance form. Third, the retention form. Fourth, the convenience form. Fifth, the cavo-surface angle. Sixth, make the toilet of the cavity.

The outline form contemplates the obtaining of extension for prevention and the esthetic form.

EXTENSION FOR PREVENTION.

Extension for prevention means the carrying of all the margins of the cavity into areas of relative immunity to dental caries. It will not be possible for us to make an extended observation of this principle, nor indeed of any of the principles that we predicate, for time will not permit. Suffice it to say that there are areas of immunity and susceptibility upon the surfaces of the teeth, such immune areas being those which are naturally kept clean by the excursions of food over the teeth during mastication, and the movements of the lips, tongue, and cheeks. The susceptible areas are those which lie in places protected from the frictional movements referred to, and thus harbor the organisms which make for decay, for we know that decay cannot take place unless the organisms of decay are able to attach themselves to the teeth, and there remain in undisturbed quietude to prey upon the dental tissues. All pits and fissures must be followed out to their full extent, so that the margins of the inlay or filling may lie in smooth territory, for if this were not done, and a fissure were allowed to remain in part, the remaining part of the fissure would harbor the organisms, and a recurrence of decay would occur about the filling. The buccal and lingual margins must be carried far enough out of the embrasures that the margin of the filling will not be in contact with the approximating tooth. The gingival margin should be carried far enough so that the margin of the finished filling is covered with the gum. In short, all margins must be in territory that is automatically kept clean.

ESTHETIC OUTLINE OF CAVITY.

The esthetic form is that which we give to the outline which will, to the greatest degree, conserve the beauty of the tooth. It is our duty not only to save the teeth, but to do so with the least possible interference with esthetic appearance, and in order to do so we must be artists as well as artisans. The filling should be as unobtrusive as is consistent with safety, but I should hesitate to sacrifice safety to beauty, unless it were the express wish of the patient. All external lines should be gently curved, for a curve is always more beautiful than an angle, and lastly, the original form of the tooth must be as perfectly restored as it is possible to do, for there is nothing that detracts from the appearance of a denture more than a lot of misfit teeth, one filled to one form and another to quite a different form and size.

RESISTANCE FORM OF CAVITY.

The resistance form is that which is given to the cavity in order to cause the filling to resist the forces brought to bear thereon. The depth and width of the resistance form must be determined by a study of the conditions obtaining in the case under consideration. Some individuals exert a force of from 250 to 300 pounds upon their teeth during mastication, while others of weaker muscular physique and possibly a sensitive peridental membrane as a result of a pyorrheal tendency, exert a force of but from 50 to 75 pounds. It would obviously be foolish to cut as broadly and as deeply in the latter individual; yet, if we did not cut sufficiently well in the former individual, failure will soon re-

sult by reason of the filling being forced out by the stress brought to bear upon it. The resistance form is best obtained by making cavities with flat seats, for a flat foundation distributes the forces that are exerted upon it in the most equable manner. If the foundation were rounded, the filling would have a tendency to rock under the stress of mastication, and this tendency frequently resisted would in time cause a movement in the filling that would make for failure. We insist, therefore, on placing fillings upon bases that are as flat as it is possible to make them.

RETENTIVE FORM.

The retentive form is that which is given a cavity that will resist the pulling forces that have a tendency to lift the filling out of the cavity. Pits, grooves, and deep undercuts were the methods that obtained in the practice and the teaching of too many of the older practitioners, and unfortunately have not been completely banished from the practice of very many operators of the present day. These means of retention are not only unnecessary, but positively harmful, as we might show if time permitted. The only retention necessary for a well-condensed gold filling is parallel walls deep enough to afford sufficient grasp of the gold upon the walls of the tooth. In making a gold foil filling, it is permissible to make a slight undercut, but this should never be deep, and it is scarcely necessary to add, such practice is obviously contra-indicated in the making of a gold inlay. I said that the cavity should be deep enough, and I wish to emphasize that statement, for many of the failures that it has been my privilege to study have been caused by a too shallow cavity preparation. Often the cavity is scarcely cut through the enamel. The cavity must be made deep enough to afford sufficient grasp upon the axial walls to afford a sufficient frictional resistance. Just how much that must be cannot be stated, for all cases are not alike, and the preparation of the retentive form must be made with an intelligent perception of the conditions that the finished filling is to meet.

CONVENIENCE FORM.

The convenience form is that which is given to a cavity which enables the operator to adapt his filling material perfectly to the walls of the cavity. Again it is not possible to set down any fixed rules; indeed, the form which it would be easy for one operator to fill might be an absolute impossibility for another. So the only rule that we can make is always to prepare a cavity in such a manner that the operator will be able to fill it perfectly with the material which he has chosen for the case in question. It is much better to sacrifice a portion of a good tooth in order that a perfect filling may be made, and thereby to save the tooth permanently, rather than to leave a doubtful portion and render it impossible to make a perfect restoration and thereby cause a failure with perhaps the loss of the whole tooth, or if not, certainly with the loss of a greater part than would have been lost if the original filling had not been a failure—to say nothing of the inconvenience caused the patient and the chagrin occasioned to the operator.

PREPARATION OF THE CAVO-SURFACE ANGLE: REASONS FOR BEVELING.

The cavo-surface angle should be beveled all around the cavity. I know that some operators advocate the butt joint, but I do not believe that they have any scientific evidence upon which to base their recommendations. The margins should be beveled—

First: To protect the enamel rods. We know that enamel is one of the strongest tissues in the body when its continuity is unbroken, but, by reason of its histological structure, once there is a break in the enamel surface the rods immediately contiguous to the break will be unsupported, and upon the slightest stress will fall into the ditch caused by the absence of the rods concerned in the break. Moreover, any rods that do

not reach from the surface of the enamel to the dentinal junction are very weak in their resistance to stress, and fall out very easily; therefore no short rods should be left unprotected upon the surface of the cavity. This can only be prevented by properly beveling the surface of the enamel, or by having such an intimate knowledge of the enamel that all of the enamel preparation will be so made that there will be no short rods left at the surface. We are willing to admit that this can be done, but it is much easier and safer to bevel the margin and thus be sure that all rods are perfectly protected. We should have an intimate knowledge of the histology of the enamel, for we cannot intelligently operate without it.

Second: The beveling of the cavo-surface angle causes a flange to be cast upon the margin of the inlay which can be burnished to perfect contact with the tooth immediately after cementation, thus making an hermetical joint, and minimizing the cement line to the greatest possible degree. If the butt joint is used, it will be impossible to burnish the inlay to adaptation; indeed, it would be unwise to attempt it, for the burnisher would come in contact with the unprotected enamel rods at the margin and cause a checking thereof;—so, if for any reason one persists in the use of the butt joint, he must not attempt to burnish the inlay to the tooth.

Third: In the butt joint there is an end-to-end adaptation of gold and tooth, and, be the fit ever so perfect, we know that it is impossible to compress cement to a thinness of less than the one-thousandth of an inch; therefore we will have a thin plate of cement between the inlay and the tooth which has no protection, and the constant pounding of the forces of mastication upon the inlay will be transmitted to the thin plate of cement, which will be disintegrated and eventually fall out and leave a wide-open ditch for all sorts of invasion. The flange upon the inlay, however, can be burnished down to the tooth, the cement line pinched off to the greatest possible degree, and what cement is left will be protected from stress by the flange which seals it in.

TOILET OF THE CAVITY.

The toilet of the cavity comprehends the thorough cleansing of the cavity from all chips, residual decay, or débris of any kind. In the making of a gold filling, the freshly cut dentin, prepared under the protection of the rubber dam, offers the best condition for the adaptation of the gold, and any wash is therefore contra-indicated. If the inlay is to be used, and the cavity has been prepared without the rubber dam, then the cavity should be thoroughly rinsed out with warm water immediately before the cementation of the inlay, and should then be washed with alcohol.

The preparation of a cavity is practically the same for an inlay as for a gold filling, the only possible difference being that in the preparation for a gold filling some undercut retention is permissible, while for an inlay this is, of course, absolutely prohibited.

PERFECT ADAPTATION OF THE FILLING MATERIAL.

No matter how perfectly our cavity has been prepared, if the filling material that is to make the restoration is not perfectly adapted to the tooth, so as to seal it hermetically and protect the dentin from the incursion of moisture and micro-organisms contained therein, the operation will be a failure. The perfect adaptation of gold to the tooth so that it will permanently save the tooth is a fine art. The gold must be so inserted that it will be in perfect adaptation to the walls of the tooth at all points, for a filling is no more perfect than its weakest point. No matter how perfect may be the rest of the filling, if it is imperfect at one point and fails at that place, the whole filling is a failure. In the adaptation of gold to the cavity, a plugger of medium size should be used, one about 1 x ½ millimeter for cavities in proximal surfaces of incisors, and one a little larger for cavities in the proximo-

occlusal surfaces of the molars and bicuspids. If too large a plugger is used, too great a degree of force is necessary to condense the gold properly, and if the plugger is too small it will chop the gold and fail to condense it perfectly. In making the filling, the gold should be started in one of the angles, and then each succeeding pellet malleted toward the walls of the cavity. In condensing a pellet of gold the plugger should be started toward the center of the cavity, and in a series of steps the plugger should travel toward the wall of the cavity against which the gold is to be condensed. When the wall of the cavity is reached, the plugger should be lifted away from the gold and again seek the center of the cavity and again travel toward the wall, and never should the plugger travel away from the margin toward the center of the cavity, for in so doing we are causing the gold to draw away from the wall, and inasmuch as the malleting has tempered the gold and made it springy, it will be impossible to bring it again into perfect adaptation to the cavity walls. The filling should be thus built up by laminating the gold, or shingling it, to make the whole filling stronger.

DENSITY OF MALLETED AND CAST GOLD FILLINGS.

The life of a gold filling depends a great deal upon its density. We know that cast gold has a specific gravity of 19.2, and the closer we can approximate that density in a filling the better it will be, while a filling with a specific gravity of less than 14 will be a failure in a short time. This is due to two reasons: First, the filling will be too soft to resist the stress of mastication; second, by reason of the very high percentage of air-spaces the filling will be little better than a sponge, for the whole interior of the filling will contain air-spaces which will readily give up the air in exchange for moisture laden with all kinds of impurities. The ingress of the moisture will break up the cohesion of the pellets of gold, and in time it will be possible to pick out the filling with an excavator.

We do not have the problem of density to deal with in making a cast inlay, for the gold is at its highest density when cast, and there are no air-spaces with which to contend; but the problem of softness is very much in evidence. Pure gold has been advocated as the material to be used in the making of all cast gold inlays, for the argument has been advanced that, since in the cast inlay we have the gold at its highest density, we have it in its ideal form for the making of a filling. These advocates forget that gold is softened by heating, and tempered or hardened by malleting or beating. Consequently a gold filling of a specific gravity of 18 will be harder and much more resistant to stress than one of cast gold with a specific gravity of 19.2, because, in the making of a filling, each pellet of gold is beaten again and again so that it attains its maximum hardness, but in the gold inlay the gold has been annealed to its greatest extent, and is consequently at its softest state.

SELECTION OF GOLD FOR CAST INLAYS.

It is true that pure gold gives us a more perfect cast than any other material, but whenever stress is to be exerted upon it, its use is contra-indicated by reason of its softness and its inability to stand up under the strain of mastication.

In cavities in the proximal surfaces of incisors, pure gold is the best material to use, for here no particular stress is brought to bear upon the inlay; but in proximo-occlusal surfaces of molars and bicuspids an alloy should be used. For ordinary cases an alloy of 23-karat gold will be amply sufficient. I personally reach this karat approximately, by using half-and-half pure gold and S. S. W. 22-karat plate gold. This gives an alloy of sufficient resistance, of as good color as the pure gold, and one that casts almost as perfectly.

In cavities demanding a great deal of resistance, an alloy of gold and 5 per cent. platinum may advantageously be used.

METHOD OF MAKING WAX MODELS FOR INLAYS.

The problem of adaptation of gold inlays is of the greatest importance, and the success or failure thereof involves a knowledge and an intelligent use of the principles of the manipulation of the wax in model-making and casting of the inlay.

A wax should be used that is hard at mouth temperature, otherwise the wax will have to be hardened by the use of cold water, which will cause a shrinkage of the wax. This shrinkage added to the natural shrinkage of the gold will cause a discrepancy in the finished inlay that will greatly militate against its success. The wax should be brought to the proper temperature, so that it will not be too soft or too hard, by immersing it in water of the right temperature, or in an electric heater made for the purpose, or, if care is exercised, over the open flame. The wax should not be melted, and if too soft it should be allowed to harden before being introduced into the cavity. When ready it should be in the shape of an elongated cone and be introduced into the cavity with a steady pressure. The thumb and first finger of the left hand may be placed on the buccal and lingual surfaces of the tooth and act as a matrix if no matrix be used, and then with the forefinger or thumb of the right hand the wax is thoroughly and firmly pressed into the cavity, this pressure being maintained until the wax is hard. This is done for the purpose of forcing in additional wax as the shrinkage of the wax in cooling makes place for it. When the wax is hard, the patient should not be asked to bite into it, as is the custom with some operators, for the wax is thereby displaced from its adaptation to the walls of the cavity, and a distortion of the inlay will be the result. The wax should rather be carved to occlusion, and the artist will have the opportunity to display his skill to the highest degree in the reproduction of the sulci and occlusal planes.

The investment of the model, its burning-out, and the casting are problems that I dare not attempt to discuss in brevity. Suffice it to say that the model should be immediately invested, should not be burned out to such a degree that the investment is weakened by the heat, and should be cast in a cold mold.

CAUSES OF FAILURE OF CAST GOLD INLAYS.

In conclusion let us state that by far the great majority of the failures of the gold inlay are attributable to a faulty cavity preparation, which causes the inlay to fall out of the cavity. I have no doubt that such a preparation would be the cause also of recurrent caries if the inlay stayed in long enough for such recurrence, for in most cases which have come under my observation the extension form had been wofully ignored. This cause of failure can be corrected by a study of cavity preparation and the observance of the laws relating thereto as laid down by Black.

Another cause of failure is the omission of a proper beveling of the margins.

The third cause of failure is the use of pure gold in inlays upon which a great deal of stress falls; such gold will, as a result, often flow to so great a degree as to overhang the surface of the tooth.

I am a firm believer in the gold inlay as a means for saving a tooth in which it has been properly placed, so much so that the cast gold inlay is taking an increasingly larger place in my practice as time goes on and I have the opportunity of observing its beneficent office in the saving of the teeth of my patients, together with a degree of comfort in its insertion that was never remotely approached by the gold filling.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

CORRESPONDENCE.

EMETIN HYDROCHLORID AND PSORIASIS.

To the Editor of the Dental Cosmos:

Sir.—In view of the great difficulty, if not the impossibility, of effecting a cure for the skin disease called psoriasis, I take pleasure in making the following report.

In treating pyorrhea by the emetin hydrochlorid method, as advocated by Drs. Barrett and Smith of the University of Pennsylvania, several phenomena well worthy of mention have occurred. The principal one, and the one with which this article will be concerned, is the apparent cure, or at least the disappearance during the course of treatment for pyorrhea with emetin hydrochlorid, of all symptoms of psoriasis in a patient who for fifteen years had been suffering from that disease.

The backs of both hands were completely covered with most repulsive-looking, inflamed, somewhat corrugated and scaly surfaces. This condition was also found in large patches on both arms and on some parts of the body. The disorder had been many times diagnosed as psoriasis. The patient had been treated for many years by different physicians, and informed me that he had used every known remedy that the physicians whom he had consulted could think of, to try to alleviate his condition or effect a cure, but with very little if any benefit, and he had finally become so discouraged that he had given up all hope of ever being cured of this very disagreeable malady.

In the treatment of his teeth for pyorrhea, I followed the course prescribed by the originators of the treatment already mentioned, and after the third treatment the patient voluntarily called my attention to the lack of itching and the apparent improvement in his skin disease, and voluntarily expressed a desire to have some of the emetin injected under the skin of the hand—indicating the benefit recognized, after the third treatment, by the patient himself. I did not comply with his request, but continued to treat the gums locally as before stated until the full course of treatment as prescribed was finished. At the present time, six treatments having been given—and it being now two weeks since the last treatment—every symptom of psoriasis has entirely disappeared.

It gives me great pleasure to report what seems to be a remarkable benefit, if not cure, of this very stubborn skin disease; and I hope that other practitioners, seeing this, may be able to afford other patients suffering from the same cause an equal benefit.

Respectfully,

Wm. R. Chaplin, D.D.S.

Savannah, Ga., January 4, 1915.

REQUIREMENTS FOR THE PRACTICE OF DENTISTRY IN BRAZIL.

To the Editor of the Dental Cosmos:

Sir,—As there appears to be considerable interest shown by dentists in America in the requirements for the practice of dentistry in Brazil, judging from the number of inquiries I have received on the subject, I shall be glad if you will publish the following for the information of those interested:

First. A diploma from a reputable dental college is required.

Second. The secretary of the college granting the degree must appear before a notary public and certify that the diploma is the identical document authenticating the degree conferred on the holder thereof on the date specified, the certificate being pasted to one edge of the diploma.

Third. The signature of the notary public must be certified to by the secretary of the state in which the college is chartered.

Fourth. The signature of the secretary of state must then be certified by the Brazilian consul. Fee $1.65.

Fifth. On arrival in Brazil the diploma must be presented to the department of Foreign Relations for certification of the consul's signature. Fee 550 reis. ($0.16½.)

Sixth. The diploma is then presented to the federal treasury, where stamps to the value of 1200 reis ($0.35) are attached.

Seventh. A petition is then made bearing a 300 reis ($0.09) stamp to the secretary to the Faculty of Medicine of Rio de Janeiro, to which is attached the legalized diploma, and the treasurer of the Faculty of Medicine's receipt for 200 milreis ($65.00), asking that the date and time for examination be set.

Eighth. The examination is in three parts—oral, written, and practical—and the language is Portuguese or French, covering subjects as covered by the boards in America. If the candidate fails, 100 milreis ($32.50) is remitted.

Ninth. Having passed the examination the candidate takes his diploma to the board of health in the place where he expects to locate, for registration. No fee.

Tenth. There are two yearly fees—federal, 40 milreis ($13.00), and a municipal sanitary tax.

Eleventh. The diploma so registered allows one to practice anywhere in Brazil, as the examination is a federal and not a state examination.

Marcellus Rambo, D.D.S.

Rua d'Assemblea 104,
Rio de Janeiro, Brazil.

Proceedings of Societies.

PENNSYLVANIA STATE DENTAL SOCIETY.

Forty-sixth Annual Meeting, Philadelphia, June 30, July 1 and 2, 1914.

(Continued from page 86.)

WEDNESDAY—*Afternoon Session.*

THE meeting was called to order on Wednesday afternoon, July 1st, at 2.30 o'clock, by the president, Dr. Howard S. Seip.

Dr. Seip announced as the first item on the program for the afternoon session, the reading of a paper by Dr. H. E. KELSEY, Baltimore, Md., entitled "The Normal Function of the Child Denture in Its Relation to Development of the Jaws and Other Facial Bones and the Preservation of the Teeth."

[This paper is printed in full at page 178 of the present issue of the COSMOS.]

Discussion.

Dr. G. L. S. JAMESON, Philadelphia. Dr. Kelsey's paper is an argument for the natural, simple life from the very beginning. It is an axiom in physiology that, in proportion as an organ is used or disused, it either develops or deteriorates. It is also an axiom in clinical medicine that it is very much easier to prevent disease than to cure it; and Dr. Kelsey has dwelt on these two phases. The first function of the child when it is born is crying, thereby opening up the respiratory organs, and the second function is the desire for food. The probability is that dental troubles start at the very beginning of life. I have in mind one family in which the three oldest children were fed with the bottle with a small nipple, but the fourth child was nursed by the mother. This child never had any adenoid or tonsil trouble, but the other three had hypertrophied tonsils and adenoids, and I have thought many times that the trouble with these children started at the very beginning of life.

If the child takes food in the normal way, the breast so fills his mouth that he either must give up the food which he is so anxious to take, or else must force the nasal passages open. The process of taking food occupies a considerable portion of the time in the early stages of life, and breathing through the nose during the taking of food opens up the nasal passages, and starts the child in breathing properly. On the other hand, if the child is given a nipple, it is very easy to take in air around it, and the child does not go to the trouble of breathing through the nose. I believe that this is the beginning of trouble with the breathing apparatus, which has a great deal to do with the proper development of the dental organs. If the child does not breathe properly, the organs of the mouth will not be developed properly.

Coming to the question of the child's proper use of the teeth, we all know that foods are now so prepared that children particularly do not use their teeth as they should, thereby losing the stimulation caused by mastication. When the teeth are properly used in mastication, the dental organs are stimulated, and consequently are better developed. The

essayist dwells on artificial foods. I have always thought that the nearer we keep to a milk diet in early life, the better.

As I said before, any organ that is used is developed, and any organ that is not used is not properly developed. In my practice I have made it a rule to have children taught to masticate as early as possible and to eat the crusts of toasted bread, or what we call Educator crackers. It is a good practice to give them bones to suck and bite upon, as these all have a tendency to stimulate the organs of the mouth. There are, however, cases in which, although the child is taught to breathe properly and is so fed that he uses the organs of the mouth, yet there may be some interference with proper development of the teeth and jaws, and these are the cases where the orthodontist begins his work. We can all recall having seen in years past many people with protruding teeth, receding chins, irregular teeth, etc., but in the future all well-bred people should be free from facial and dental deformities. The corrections that are being made by the orthodontists at the present time will make a decided impression on the generations to come. We will be a much better-looking people, and as the organs of mastication are enabled to perform their functions more normally, we should be a healthier race.

The essayist, of course, has been considering the question of digestion in its entirety, which is a mechanical and chemical process. If the child does not masticate, the food is not properly insalivated, hence the first step in the process of digestion is imperfect, and the whole process is impaired. It has always seemed to me that the process of digestion is much like the manufacture of some chemical in which we have to add certain substances in the beginning and others later on, until completion of the reaction, but if we make a false start, we shall have an imperfect result. The proper mastication of food, I think we all agree, is not only good for the dental organs, which it develops and stimulates, but it also renders the process of digestion more complete and thorough.

After thirty years of practice I have come to the conclusion that, in order to practice dentistry properly, we should see our patients at the very beginning of life. I make it a point to see my little patients as early as three or four years of age, to ascertain that they are breathing and feeding properly. In many cases I find that the child is not breathing properly, and then I feel it my duty to call the attention of the parents to this fact, and induce them to take such steps as to enable the child to breathe properly. If that is not done at the age of four or five years, there will probably be a more or less abnormal development.

Dr. S. Merrill Weeks, Philadelphia. To my mind this is one of the most encouraging papers that has come to my attention for some time, and I hope you will not pass it by without careful consideration.

I believe the principles put before us by the essayist have to do with the fundamental causes of faulty development of the dental organs and of parts even farther removed from the dental arches than we had supposed. It seems to me to be a glaring frailty of man to begin at the wrong end of all problems to arrive at a solution—in other words, to work backward.

The medical men were for years expending all of their efforts in the endeavor to cure disease rather than to find some means of prevention, and it is distinctly encouraging to know that they are now equally as eager in their efforts to find the causes of disease and to devise means of averting it. Thus it is with the difficulties under consideration. No matter how proficient we may become in the science of correcting oral deformities, our progress toward the millennium is slow indeed, if we can do nothing to prevent the occurrence of these deformities.

I so thoroughly agree with all the facts presented by the essayist that I can only emphasize what he has said.

I recognize that there are many and varied causes of oral deflection, but I am satisfied that the principal cause

of subdevelopment is the lack of use, brought about in the manner set forth by the essayist. An examination of many skulls of uncivilized people shows the percentage of undeveloped arches to be small, because their habits of diet are such as to insure much exercise of the teeth and arches. The teeth in these races are well worn by use, while, on the other hand, we find in the many undeveloped arches of the present time very little wear of the organs of mastication.

We know how necessary it is that any organ be used in order that it may properly develop. For this reason it is inconceivable why so many child-specialists almost invariably prescribe premasticated and predigested foods for children who are troubled with digestive irregularities. Many such troubles, I believe, could be overcome if the child were never permitted to acquire a distaste for thorough mastication which is persistent and pernicious through life. When Fletcher promulgated his scheme of mastication for man's benefit, he builded better than he knew, and if it could be applied to every child we could in time hope for a race that would have but little use for the orthodontist or the specialist in digestive disorders.

Dr. F. C. Friesell, Pittsburgh. After reading Dr. Kelsey's paper, which was sent to me some time ago, I realized that in agreeing to discuss it I had either underestimated his ability or overestimated my own capacity. Many of you will agree that the essayist has made statements that just invited questioning, and then quickly forestalled opposition by admitting the probability of limiting factors—which is good generalship.

The essayist has presented to us a message containing some important factors which are being overlooked or neglected by the dentist in his daily work.

Natural provision for the organs of mastication is made at a very early date in the embryo, the mandible being the first bone in the body to calcify, and the crowns of the deciduous teeth being well formed prior to birth.

While lack of enforced function of mastication may account for *some* cases of caries and malformation, I am inclined to believe that failure to clean the teeth and mouth properly may be considered as the cause for the greater percentage of carious teeth, while acquired habits of thumb or tongue sucking, nasal obstruction, mouth-breathing due to carelessness or laziness, also inherited physical inharmonies, intermarriage between persons of different nationalities, etc., will explain the larger percentage of malocclusion and deformities in the jaws and teeth of children.

Science and reason may argue for certain definite rules of life, but environment, custom, and conventionality may demand some departure from such rules in order that our idea of comfort and happiness may be realized. Ought we to refuse to ride by train, streetcar, or other conveyance, because, in so doing, we are not exercising certain muscles in the way nature intended?

We can advise the parents whose children come under our care, and impress them with the necessity for the proper mastication of food and oral hygiene, but do you believe that we can ever prevent the man of large stature from marrying the woman of diminutive size? Until such phases of eugenics can be controlled, we may not expect any appreciable decrease in the great number of cases of malocclusion and malformation that we now observe in the mouths of children.

Dr. J. V. Mershon, Philadelphia. Dr. Kelsey has very clearly pointed out in his paper a saying of Dr. Noyes, namely, that bone is built in response to mechanical stimulation, the chewing of food by the infant supplying the mechanical stimulation necessary for the development of the maxillary bones. The essayist pointed out particularly that the dentist's important responsibility does not begin after all the teeth are erupted, but starts practically at the birth of the child. It will be a tremendous step forward if the members of the dental profession start to send for the babies of their patients as early as they are fit to be brought to the dental office

for examination. The essayist has mentioned another fact in regard to which the dental profession has been taught wrongly, judging from many mouths in which the deciduous teeth are still present; and that is that malocclusion rarely exists in the deciduous teeth. I believe it is beginning to be generally accepted among orthodontists that a large percentage of malocclusion of the permanent teeth is only an exaggeration of that which already existed in the deciduous denture, and undoubtedly can be traced to a lack of proper mechanical stimulation, which the essayist dwelt upon so ably.

Dr. J. G. Lane, Philadelphia. The subject under discussion is certainly a very interesting one, and has been exceedingly well presented by Dr. Kelsey. I believe there is no other branch of dental science in which such beneficial results could be obtained by prophylactic measures as in the prevention of malocclusions. As has been stated by the essayist, Dr. Jameson, and Dr. Mershon, it is easily possible, by prophylactic measures and by precautionary methods, by having the functions of these various organs and tissues made normal early in life, to prevent malocclusions.

Dr. Kelsey (closing the discussion). I have very little to say in closing. Most of the discussion has been an elaboration of ideas contained in the paper. Dr. Friesell probably misunderstood some of the points I intended to emphasize. My paper was in no sense a discussion of the etiology of malocclusion, except as related to this one phase, which I consider one of the most important. If he could substantiate the theory that the intermarriage of persons of greatly different characteristics—such as size, race, etc.—is responsible for serious malocclusions, I am sure he will do a great favor to the profession. Fifteen or twenty years ago this question was being much discussed, but it has not been taken very seriously in the last ten years, though I am not willing to say that it may not be revived with some success, and if it does contain any truth, we would like to know about it.

Dr. Mershon. I move that a vote of thanks be extended to the essayist for his very valuable and instructive paper. [Motion carried.]

Motion was then made and carried to adjourn until the evening session.

Wednesday—*Evening Session.*

The meeting was called to order on Wednesday evening, July 1st, at 8 o'clock by the president, Dr. Seip.

The first item on the program for the evening session, as announced by the President, was the reading of a paper by Dr. W. D. DeLong, Reading, Pa., entitled "Anesthesia and Its Relation to Operative Dentistry."

[This paper is printed in full at page 162 of the present issue of the Cosmos.]

Discussion.

Dr. R. H. Riethmüller, Philadelphia. Whenever there is a new appliance, a new method, or theory advanced in dentistry, unusual enthusiasm is displayed. This of course is one unmistakable sign of the progressiveness of dentistry; yet, on the other hand, a progressive spirit is simply a duty of the up-to-date practitioner. The man who is behind the times to the extent that he does not familiarize himself with the latest theories, apparatus, and methods is nothing short of criminal. He is as criminal as the surgeon who does not follow the strictest rules of asepsis simply because thirty years ago—or during the time of "the war"—wounds healed and limbs were amputated without any rules of asepsis being observed,—and some of the victims still live to tell the tale. But enthusiasm in dental endeavors has sometimes overreached itself, and the general wave of disappointment is almost always associated with an absolutely injudicious condemnation of the very methods which, at the beginning, were taken up with such enthusiasm. We only need to point out, for example, the enthusiasm with which cataphoresis was practiced, and the disgust with which it was soon dropped, although there was

considerable merit in that method. The same applies to cocain. When Koller, in 1881, demonstrated the merits of cocain, the application of this alkaloid was taken up with excessive enthusiasm, but, alas, experiments had not been carefully carried out, and a great many disappointments, in fact a great many disasters, followed the early application of this drug in dentistry. I might mention other examples, such as processes of casting and casting appliances which were at first received with enthusiasm and then dropped with disgust. Celluloid plates, porcelain, and other similar methods have had similar experiences. Caution is also to be advised in the new field of local anesthesia. A great many anesthetists are taking up novocain-suprarenin anesthesia, but I for one would be the last person to advise the injudicious use of this most valuable method, unless the practitioner fully realizes the absolute necessity of a mastery of the pharmaceutic, physiologic, and anatomic principles upon which the method is based, and a full appreciation of the imperative necessity of absolute asepsis, without which local anesthesia can only do harm.

Our essayist justly emphasizes that the dentist is able to become an anesthetist, fully as capable as the medical man—for have not such men as Wells, Hewitt, Teter, Fischer, and others taught medical men a great deal that they did not know about anesthesia, both general and local? Yet if every dentist is supposed to be his own anesthetist, general as well as local, it would be advisable that he receive more efficient training in the diagnosis of cases before inducing anesthesia. The dentist, of course, in the short period of his training is hardly able to become a proficient diagnostician of lesions of the heart, kidney, and lungs, but he should be able to make a fairly thorough and reliable preliminary examination in every case in which general anesthesia is to be induced. If the dentist suspects systemic lesions, it is a very wise policy on his part to call in a trained anesthetist, and let him assume the responsibility of anesthetizing the risky patient.

Our essayist very justly emphasizes the fact that the machine will never take the place of the anesthetist. It is the operator's personal experience, his circumspect methods, his wide range of knowledge, and also his personality which are very important factors in regard to the safety of the anesthesia that is to be produced. The essayist very ably remarks that anesthesia is no plaything. Accidents will occur, but luck is usually with us; yet luck is not a scientific principle, and no method should be followed in which luck is relied upon as an important factor. How many dentists are there who daily induce general anesthesia, or analgesia—which is only the incipient stage of general anesthesia —who have more of a guard against accidents in their offices than a bottle of stale aromatic spirits of ammonia? And how many practitioners are thoroughly familiar with the methods of resuscitation? A great deal more caution is probably advisable, as the essayist says, in guarding against accidents, so that when they do occur—and, as most of you know, they will occur—the operator will be able immediately to combat any more serious sequelæ. This, of course, necessitates constant vigilance on the part of the anesthetist—who, in the case of the dentist, must assume the responsibility of the anesthetist as well as that of the operator. The surgeon's duty is considerably simpler than that of the dentist. The surgeon leaves the induction and control of the anesthesia completely to the trained anesthetist, who sometimes is not quite so well trained as he should be, because he is a green interne; yet the surgeon will not have his operation, no matter how simple or complicated it be, interfered with by the watch necessary over the patient's behavior under the anesthetic. Therefore, in any extensive or serious surgical work, I cannot see how the operator can do without a trained anesthetist.

The essayist has very well pointed out the cases in which anesthesia by nitrous oxid and oxygen is indicated, viz, especially inflammatory conditions and the excavation of hypersensitive dentin. In these conditions the application of this

method is almost ideal. There is no danger of carrying infection to deeper strata as there would be if local anesthesia by infiltration were applied, and no possibility of injuring the vital tissues underlying the hypersensitive dentin, because all that is necessary for the painless performance of the operation is superficial anesthesia, or analgesia.

The essayist says that painless excavation of hypersensitive dentin can be performed quickly, and in practically every case with little or no bad after-effects, which is true. It is also true, however, that there are contra-indications to nitrous oxid and oxygen anesthesia, as there are to other anesthetic agents, both general and local. In this connection I would point out an article by Dr. A. H. Miller which appeared in the *New York Medical Journal,* and was reviewed in the DENTAL COSMOS,* on "Gas-Oxygen Anesthesia: Indications for Its Use." He points out that it is absolutely unwise to make anyone believe that no deaths have ever occurred from nitrous oxid and oxygen anesthesia. From an observation and very thorough perusal of something like fifty papers on this subject, published here and abroad, he shows the following report of cases of death:

OBSERVER.	DEATH ASCRIBED TO—	
Teter.....	Shock and primary cardiac failure	1
Crile.....	Myocarditis, six hours after operation	2
Lydston...	Anesthetic	3
Allen.....	Uremia	4
Allen.....	No details	25
Allen.....	No details	25
Gatch.....	Hyperthyroidism	5
Gatch.....	Pericardial effusion	5
Gatch.....	Lymphatic diathesis	5
Olow.....	Diseased heart and arteries ..	6
Boys.....	Anesthetic	7
Miller.....	Suffocation (vomitus inspired)	8
Flagg.....	Anesthetic	9
Teter.....	Impure gas	10
Teter.....	Impure gas	10
Salzer.....	Anesthetic	11
Collins....	Impure gas	12
Buchanan.	Anesthetic	13

* See DENTAL COSMOS for May 1914, vol. lvi, p. 628.

These statistics probably could be corroborated, if more reliable statistical data were compiled in this country. The statistics quoted show that the safety of nitrous oxid and oxygen anesthesia, while it far exceeds that of any other general anesthetic, is not absolute. It should be pointed out that there are certain easily recognizable contra-indications in which no risk should be run.

The essayist wisely remarks that in his practice he resorts to nitrous oxid and oxygen only occasionally, and condemns its indiscriminate use. No further comment on that very judicious statement is needed.

He emphasizes the usefulness of pain as a diagnostic agent. Pulp exposures, for instance, are easily overlooked if the patient is in the anesthetic state, and a filling might be inserted thereupon, and very serious trouble arise afterward. In this connection, I would cite a few words from a treatise by Dr. Goldscheider in regard to pain as an aid to diagnosis:

> Pain makes us realize that some external danger is threatening which we may still avoid, or that harm has already been done to the body requiring our care if we would escape more serious consequences. Pain arises as a warning signal whenever we are exposed to such conditions of life as by their continued influence would involve general disturbances of health. Pain appears before or simultaneously with the outbreak of disease, warning man that his body is in a diseased condition and requires care. . . . Pain is the physician's most powerful assistant, whose demands the patient follows in blind obedience, and who saves the physician many an advice as to diet and conduct. . . . To wipe out pain entirely is an impossibility, and we cannot and would not do without it, since pain is necessary not only as a monitor in the combat against the hostile powers of matter, but also as an inspirer to ethical emotions. For it is chiefly in the reminiscence of one's own pain, both physical and mental, that love and active charity are rooted.

The essayist appropriately points out that nitrous oxid and oxygen anesthesia involves a general intoxication of the nervous system. This has been doubted

by some friends of general anesthesia, but how could anesthesia be produced, how could the nerve terminals be paralyzed, unless such a condition as general intoxication of the nervous system were produced? We could not obtain a condition of analgesia or anesthesia unless all the nerves were affected—therefore the term "general anesthesia"—and anesthesia is only possible by intoxication. Various theories have been propounded as to how the nerve cell is anesthetized, but the actual process of anesthesia is as yet unexplained. Possibly the fatty substance within the cell, or the respiratory or sensory centers, are affected individually or in combination. The fact, however, that general intoxication of the nervous system is induced by any and every general anesthesia has been demonstrated beyond a shadow of doubt, and every anesthetist has had many cases of laughing spasms, sexual excitement, or hallucination, which prove this contention. The possibility of such occurrences renders the presence of a third person, no matter whether general or local anesthesia is induced, imperative from a medico-legal standpoint. There are dentists who are serving terms of imprisonment because of *bona fide* accusations made by persons under persistent hallucinations due to the influence of general or local anesthesia. That general as well as local anesthetics produce intoxication of the nervous system is shown by the violence with which alcoholics often resist general as well as local anesthesia. Crying spells, involuntary micturition, vomiting, and sexual excitement show that general as well as local anesthesia—general more so than local—means the intoxication of the central nervous system.

The essayist has also very fittingly pointed out that nitrous oxid and oxygen can produce a habit. This is shown by the eagerness with which some patients take the chair because they like the sensation produced by the anesthetic. In some instances, office assistants have been in the habit of robbing their employers of nitrous oxid, because they liked to become intoxicated therewith. In one case that I know of, a laboratory man consumed in one week no less than three cylinders of nitrous oxid, because he liked the effect.

It is also difficult and great caution is necessary to determine whether a patient is really in the analgesic or the anesthetic state. The dividing line is extremely difficult to define, and in a great many cases when analgesia is claimed to be produced, anesthesia is really present. Temperamental conditions must also be reckoned with. We know that in the South American races, owing to their excitable temperamental makeup, due to influences of the hot climate, nitrous oxid and oxygen has a different effect from that observed in the more sedate races of temperate climates.

There are some technicalities which we have to consider in employing nitrous oxid and oxygen analgesia or anesthesia. Preparation of the patient for the anesthesia is most important, if the operator wishes to relieve him of the embarrassment of vomiting or other physical mishaps. The size and shape of the apparatus must also be taken into consideration. The operator's movements are often interfered with by the apparatus, and even with the nasal inhaler the field of operation is not always quite clear. Vision of the operative field is often obscured by blood, the aspiration of which must be prevented by all available means to avoid serious consequences. The operator himself or his assistant has to make changes in the position of the patient in order to obtain the most suitable situation without interference. After the operation the patient generally requires a shorter or longer period of rest.

It should be especially emphasized in regard to nitrous oxid and oxygen analgesia or anesthesia that there is an appalling lack of realization of the necessity for the sterilization of the mouthpiece or inhaler. We are doing everything we can to stamp out that most dreaded disease, tuberculosis, yet how many practitioners are in the habit of sterilizing their mouthpieces after every use?

Nitrous oxid and oxygen anesthesia has no doubt been one of the greatest boons to general surgery, for the reason that it has reduced danger to a minimum if the anesthesia is induced by a skilled operator. Crile of Cleveland has done a great deal of valuable research in this field, and he has at the same time pointed out its limitations and the folly of swearing blindly by one method. He believes in mixed anesthesia, and his whole theory of anoci-association, which tends to do away with surgical shock entirely, is based on the combination of general anesthesia by nitrous oxid and oxygen and local anesthesia by novocain-suprarenin, by which method a large operative field is eliminated, and shock of the central nervous system is avoided.

The essayist, strange to say, finds fault with dental teachers and manufacturers. It seems that all the iniquities of dentistry are habitually charged against the schools and the manufacturers. The dental schools, so far as I know, give very careful courses in anesthesia, but the dental student is supposed to familiarize himself with all methods of anesthesia and the administration of all anesthetics. It is practically impossible for the schools to have every student induce each kind of anesthesia say 12 times, and even then there would be some dullards who, though they had the opportunity, would not fully grasp the subject and become efficient in the administration of an anesthetic. In order to have proper training in the various methods of anesthesia, a special course is absolutely necessary, and if these courses can be given by men of proper intelligence, then they will be welcomed by the profession. The essayist suggests that the societies undertake to give such courses, and in this connection I would call attention to the fact that the Academy of Stomatology of Philadelphia has instituted such a course, and I think other societies have done the same, and it is hoped that their example will be followed all over the country. At the same time I wish to express the hope that these bodies will not stop short, that they will not favor one method of anesthesia, but be broad and progressive enough to give fair consideration to all methods which have been proved valuable. Although the dental supply houses are twenty-five years ahead of the rank and file of dentistry in this respect, they are again being blamed. To illustrate: Ask the proprietors of any supply house how much money they have spent in perfecting anatomical articulators, anatomical molds of teeth, investigating the amalgam question, and in similar important dental research, and what the returns have been, and your respect for the dental supply houses will be considerably increased. They know that in a few years the progressive practitioner will demand these things, that it is their duty to engage in conscientious scientific experimentation, and I think they deserve a great deal of credit for the sacrifices which they have made and are continuing to make. Since there are not enough teachers to demonstrate to their fellow practitioners the correct use of the method of nitrous oxid and oxygen analgesia and anesthesia, who is going to demonstrate it for the dental supply houses to their customers? Moreover, as you well know, most of the dental houses have these demonstrations performed by experts who hold diplomas from reputable colleges. The dental supply houses are business corporations primarily, and not charitable institutions.

These remarks have been made not in a derogatory spirit, or by way of unfair comparison, not in any hypercritical attitude, but in an effort to safeguard one of the most valuable accessories to the dental instrumentarium against unwise and injudicious use which would only spoil its usefulness in a great many practices, and to urge as emphatically as I can that all methods which have been proved valuable be given a fair trial. The element of personality also must be regarded, and what is the operator's fault should not be ascribed to the mechanism of the machine, and good luck should never be indiscriminately relied upon.

At the recent International Medical Congress of 1913, held in London, Eng-

land, the subject of anesthesia was for the first time included as a subsection, and the London *Lancet* in commenting on this remarkable fact—at least it seemed especially remarkable in England—published in the "Annus Medicus 1913" a report on the progress made in the field of anesthesia in medicine and dentistry, and in addition thereto a very important editorial, a review of which I will read to you:

"The whole subject during the generation which has expired between 1881 and 1913 has cast off much of its unscientific trappings, while its exponents from across the seas, equally with those who are British, can lay claim to pursuing their work along lines more or less scientific. The scope of anesthesia as we know it today is so far wider than it was in the times of Simpson and of Clover that an entirely different language is used in describing the results and the procedures. Practically, nitrous oxid, ether, and chloroform, given by the simplest apparatus or without any at all, formed the armamentarium of the whilom anesthetist. . . . At the recent International Congress of 1913 the subject was reckoned of sufficient importance to obtain its inclusion as a subsection, and to tempt into its arena such distinguished pioneers of new developments as M. Tuffier of Paris, Professor Heinrich Braun of Zwickau, Professor L. Burkhardt of Nürnberg, and that eminent scientist Dr. S. J. Meltzer of the Rockefeller Institute."

The methods of introducing anesthetics have been revolutionized, and in other directions progress no less gratifying has occurred. In the days of Snow and Paul Bert, as in our own, fierce have been the contests about the dangers of anesthetic agents. There have been those who delighted to say "I am of Paul," and in response we heard "And I of Apollos;" the chloroformists *versus* the etherists, the heart-failure men against those who believed dangers arose alone from respiratory failure. Today we find that such questions can be, and indeed are, put to the test of experiment. The anesthetist no longer confines his attention to the circulatory and respiratory systems; he recognizes that metabolism may be profoundly and deleteriously affected by his agents, and his endeavor is to obtain all the good he can from his anesthetics and rob them of their potential evils. All methods adopted to prevent pain, whether those connected with inhalation, with spinal anesthesia, or with local analgesia, are subject to the disadvantage that they may produce shock, even though in their intense action it may have been their beneficent rôle to abrogate shock due to surgical trauma. Alike as synergents to anesthesia and as a means of abolishing this shock are the employment of alkaloids and the combining of general anesthetics with local conductive analgesia; and these complex systems have found expositors in Dr. Crile and Dr. Gauss, both of whom are recognized as originators of special methods. Certain anesthetics are held provocative of shock, so that nitrous oxid associated with oxygen is preferred by some surgeons. The technique of their use in major surgery has been worked out by Dr. Teter, and his report and description of his modified apparatus proved how scientifically such schemes are now elaborated.

It has been my pleasure to read and review within the last year a large number of articles on this subject, and there is no doubt that nitrous oxid analgesia is one of the most valuable aids to the dentist, but its safe and judicious application cannot be too heartily insisted upon, for if it is used in a reckless way a valuable method is once more in danger of being consigned to the scrap-heap, where we have seen other valuable methods go before. I wish to close with a few words which I used in summing up a review of several articles on this subject in the DENTAL COSMOS (see DENTAL COSMOS, July 1914, vol. lvi, p. 881): "A study of the wonderfully generous harvest in the field of anesthesia of last year and the first months of this year will convince any fair-minded reader that there is a great deal of work yet to be done both in general and in local anesthesia; that both procedures have their definite places, and that the men who are endeavoring to create an artificial prejudice as to either one or the other method are wickedly and selfishly impeding progress and doing a great injustice to dental science, which has contributed so much to the present status of perfection of anesthetic means."

Dr. C. S. TUTTLE, Philadelphia. Many times have we heard the adage that "Discretion is the better part of valor," and it appears that Dr. DeLong has added "conservatism" as well. En-

thusiasm, at times, runs away with the best of us, and it is true that from time to time men come before us who are loud in their praise of something which sounds very good at the time, but which, when viewed more calmly and in a subdued light, proves valueless. The essayist relates not only the value of nitrous oxid and oxygen, but also points out cases in which its employment for the relief of pain is contra-indicated. There is no doubt that the combination of these two gases and their application in the dental office has done more to relieve the suffering which patients heretofore have been obliged to endure than any other agent which has been presented to us. It is also true, as Dr. DeLong tells us, that an indiscreet use of nitrous oxid and oxygen will eventually result in defeating our very purpose. All of us meet from time to time in our practice patients who do not tolerate an anesthetic well, and here it would be wise to avoid the administration of an anesthetic unless it is found absolutely necessary. On the other hand, we are told that less than twenty per cent. of the population of this country are, at the present time, receiving dental attention. Perhaps ten per cent. of the balance are situated in parts of the country so remote from a dentist as to render it impossible to reach him. It is reasonable, then, to presume that at least two-thirds of the remaining seventy per cent. neglect their mouths by reason of the fear of being hurt. Most of these we will find to be well educated, and it is among the educated that we have the highly strung type, who will not submit to any painful operation. Rather will they allow caries to form, and mouth infections to make such an inroad that they finally are forced to consult an exodontia specialist. It does not take long to imagine the wonderful good we shall be able to do for suffering humanity after we have succeeded in educating these *unattended* to the possibilities of nitrous oxid and oxygen for the alleviation of pain.

Much as I admire and appreciate Dr. DeLong's scholarly essay, I must take exception to his manner of expressing his disapproval of the postgraduate courses of instruction which are now offered to the dental profession. The men teaching this work have traveled from one end of the country to the other, reaching dentists in many localities so far removed from any of our colleges as to make it impossible for them to receive any such special instruction. While it may seem to the essayist that exaggerated claims have been made by these teachers, such is not the case, and it is most likely due to a lack of searching investigation on his part that he believes that these men teach the use of the new apparatus and the administration of this anesthetic for "professional graft." Among these instructors and those who have availed themselves of the advantages of this postgraduate work will be found men high in our profession, men of integrity and honor, members of our state societies, young and old, who seek knowledge which is not, up to the present time, to be found in the dental colleges, nor is it offered in any other way, with the possible exception of one or two isolated postgraduate schools, whose teachers themselves have most likely received their fundamental knowledge in this manner. History tells us that knowledge was first spread about by traveling teachers, who later settled in certain communities which have since become famous for their institutions of learning, such as Heidelberg, Athens, Rome, etc., and, as these reverend pioneers shed light into the dark ages of ancient history, just so are these young and wideawake dentists helping a sleepy profession to awaken to its full ability and true value. They have blazed a path of increased knowledge upon which none may fear to tread. The term "financial return" may seem harsh to the essayist, when placed beside the soft-sounding term "professional fee;" but do not both these terms convey the same meaning? One is plain and straight from the shoulder, the other puts the soft pedal on the almighty dollar, for which, no doubt, our essayist as well as the vast majority of those present are struggling

today. And why not? Is it not well, and do we not owe it to ourselves and to those depending upon us, not only to leave behind us a record of work well done, but also a substantial bank account upon which our families may lean, after we have entered into the Great Beyond? You will find very few Thomas Evanses among dental practitioners—their fortunes are not so great, and if someone comes along with helpful suggestions which will tend to shorten the long—and of necessity confining—hours of the dentist, I beg that he be received kindly and not called "pseudo-teacher." Were the dollar mark branded on most of the topics taught, I, for one, would rejoice to learn of it, for judging from the appearance of fifty per cent. of the medical and dental offices, it is high time that remuneration for services were assigned a more important part in our equipment. The decreased number of graduating dental students is almost alarming, and unless something is done along the line of financial return, dentistry will go out of business. The discouragement which the younger men are receiving from dental practitioners is deplorable. I related an incident in a paper read recently before the Southern Dental Society of New Jersey, which may bear repeating here: "A few weeks ago a young man about to graduate from the University of Pennsylvania called upon me. He was evidently much depressed, and finally admitted that he much regretted having taken up dentistry; was in fact disgusted with the profession, to say nothing of being discouraged. This was due to the fact that he had the day before visited the office of an older practitioner in our city, who had told him that, had he a son, he would not allow him to study dentistry; that there was no money in the profession, and that it was generally run down at the heel." When you consider that this boy had worked four years in high school, two in a preparatory school, and three at the university, you can well imagine that this statement, coming from one who had already entered the work, was disheartening to listen to.

"Business efficiency," too, may sound harsh, but how many of us really know its true meaning? How many professional men today are using their trouser pockets for a cash drawer? We would do well to change these methods and accept a few of the lessons from our brothers of the commercial world, upon whom, after all, we are dependent for our living, and to avail ourselves of the lessons given in postgraduate work along the lines of modern business efficiency, also of anesthesia, mouth infections, and the latest method of placing a gold inlay. Rather than have this society place its stamp of disapproval upon these teachers, let it join with the other state societies, who are not only giving these men their approval, but are gathering their members in classes for this work; and it has recently come to my knowledge that several of the state societies have already made some of these men honorary members. If we can but inspire co-operation and lay aside professional jealousies, our state societies and our colleges will take on new life, which cannot but spread throughout the cosmos of dentistry.

Dr. J. D. Thomas, Philadelphia. I do not know really what more can be said on the subject of nitrous oxid anesthesia. I think we have had one of the best dissertations on this subject that I have listened to for a long time. The time seems to be ripe for this subject to be well discussed and well understood. I have had some experience in nitrous oxid, but no experience with nitrous oxid and oxygen either in the production of anesthesia or that of analgesia—and I was almost going to say that I am glad of it. Nevertheless, this anesthetic mixture has its uses, and can be made to help in the work which the dental profession has to do today.

The other objection I could raise to Dr. DeLong's paper is that he did not go deeply enough into the subject, but Dr. Riethmüller has supplemented it to a great extent. There is nothing in what Dr. DeLong has said that I cannot give him high commendation for. I have always contended that nitrous oxid

is one of the most dangerous of all anesthetics, and yet it has the reputation of being the safest of all; and why? Simply because it has been *the* dental anesthetic, and many dentists have had their own apparatus for producing anesthesia for tooth extraction for years. The symptoms accompanying it are so perceptible that, when a person shows these symptoms, we simply cease giving the gas and allow the patient to breathe air, and that has been sufficient to bring about a recovery. We are depending upon the ideal effects of nitrous oxid, yet we must remember that it is not a life-saver, but an inert gas. As soon as the patient begins to breathe gas, oxygenation ceases, and the patient is on the rapid road to asphyxia. Asphyxia produces unconsciousness in the strongest men in sixty seconds, in a child in twenty seconds, therefore this condition may be serious for the patient. For this reason I am free to say that in my opinion nitrous oxid is the most dangerous of all anesthetics, because the anesthesia comes so quickly that unless the anesthetist is very familiar with it—and it requires a good deal of practice to become expert—we are liable to have serious conditions before we realize their presence, and it is a wonder to me that we have thus far escaped with so few fatalities. At the time when Dr. Litch wrote a chapter on this subject in the "American System of Dentistry," in all the thousands and hundreds of thousands of cases in which nitrous oxid had been given to patients by dentists throughout the country for the simple operation of tooth extraction, there had been only eleven fatalities; but at that time, viz, twelve or fifteen years ago, nitrous oxid was not used by the dental profession as it is today, for general operative work. Nine of these eleven fatalities were clearly proved to be due to causes other than nitrous oxid, and only two at that time could be legitimately charged to nitrous oxid. Therefore the profession and the public at large were justified in claiming that nitrous oxid was a perfectly safe anesthetic. The statistics cited by Dr. Riethmüller, however, corroborate my contention that nitrous oxid anesthesia is by no means free from risks. Why so? Is it because the operator is not sufficiently educated in its administration? Is it because he is careless? To my mind most fatalities are more due to carelessness on the anesthetist's part than to the gas itself. You know that in hospitals the internists are almost always entrusted with the responsibility of administering nitrous oxid, while ether and chloroform are administered by trained anesthetists. Training in the administration of nitrous oxid is just as necessary as in that of ether, and anesthetists should, as I have often tried to impress upon them, take into consideration the fact that there is no necessity for extremely profound anesthesia, but that there is a surgical zone, a zonal obliteration of reflex which, after it has once been reached, will require little ether, chloroform, or nitrous oxid to preserve for the operation. If this rule is observed, the patient will completely recover a very few minutes after the operation has been finished. I was some time ago present at an operation on a boy of fifteen years of age, in whose fingers fragments of a needle had become lodged, as the X ray showed distinctly. The operation was done under ether, and it did not require more than three minutes for the surgeon to remove the needle, but the anesthetist kept pouring on ether until the whole operation was completed and the wound bound up, and the boy did not recover from the anesthetic for forty-five or fifty minutes. There was no necessity for this anesthetic procedure, and I should not have been surprised if the patient had died, because he looked exceedingly white, and was not normal for a week afterward.

Dr. Riethmüller has referred to alcoholics. We know that the only difference between nitrous oxid and alcohol intoxication is that, in the one, anesthesia is produced by inhalation, in the other by ingestion. Suppose alcohol anesthesia is carried to the extreme, what is the process? First stimulation, then exhilaration, intoxication, stupor,

unconsciousness, and, if we go far enough, death. The same process goes on when anesthetics are given, but why should we carry anesthesia to that point? If a man falls down on the street and gets to the point of stupor and unconsciousness, there is no reason why we should want to keep him in that condition. After the surgical zone is under control, there is no reason to keep pouring on the anesthetic and continuing the condition for another twenty-four hours. We would then be running a risk with the patient, particularly so in the case of nitrous oxid.

A short time ago a physician who is well versed in administering anesthetics brought a patient to my office for the extraction of some teeth under nitrous oxid. I administered the gas, and began to extract the teeth. When I started, this physician told me not to begin yet, as the patient had not relaxed. After I had finished the operation, I told him that the patient did not have to relax under nitrous oxid. If I saw a patient relax under nitrous oxid, I would consider him very near death. After the anesthesia has been carried to the extent of the tonicity of the nervous system, anything beyond that stage will produce exhaustion, and finally collapse, and this we do not want to occur under nitrous oxid.

A great deal has been said tonight about the proper education and experience of men who are to give anesthetics, particularly nitrous oxid and oxygen. That is absolutely essential, of course, but as for danger, a great deal has been said of accidents under nitrous oxid anesthesia in cases of heart lesions, kidney lesions, albuminuria, diabetes, and different cases of inflammations or lesions of the vital organs; and yet I would rather administer nitrous oxid than any other anesthetic to a patient with heart disease or diabetes, provided the patient has enough vital force to bring him back to normal. This vital force is the guide I go by in administering nitrous oxid. The oldest patient I ever administered nitrous oxid to was ninety-two years of age. I have had hundreds of cases of from eighty to ninety years, and children of all ages, but I have never come so close to fatal accidents as with some of the strongest athletes, whose constitutions are ruined by the strenuous athletic activities of the present day. That may seem strange, but I contend that in running races as practiced at the present time, the nervous system, the vital force, is carried to such a point of collapse and exhaustion that the athletes cannot regain their normal vigor, and these men are the most dangerous patients for anesthesia, because we have nothing to guide us. The patient may be a fine-looking fellow, full of vigor apparently, but the anesthesia reduces his vital force to such a point that it is difficult for him to recuperate. Only a month ago I had such a specimen come to my office from Baltimore for the removal of an impacted third molar. He went through the operation as nicely as could be expected. After the operation, while he was rinsing the mouth, his face became very pale, and he quietly folded his arms and passed off into unconsciousness, and it required some three or four minutes of hard work at artificial respiration before I succeeded in getting the patient to breathe normally again.

Dr. Riethmüller spoke also of nausea. I received a letter from Dr. Teter some time ago which gave me an inkling of the frequency of this condition, and in which he asked me fifteen questions in regard to nitrous oxid and oxygen. I could not pretend to answer them all, because this would have required writing a book, but I attempted to answer those which were particularly interesting to me. He asked in the first place, "What percentage of nausea do you have following operations under nitrous oxid alone?" The next question was, "What percentage of nausea do you have following operations under nitrous oxid and oxygen?" I have not seen a case in twelve years, in over sixty-five thousand administrations. The next question was, "Have you had any cases remain unconscious unduly long after the discontinuance of the anesthetic, and if so,

how long have they remained unconscious?" I never saw anything of that kind. The next question was, "Have you had any fatalities, and if so, how many?" I never had any fatality in my office, that is, in any ordinary case. The only case I have ever had is one that could be explained by some other cause. A friend of mine, a strong man weighing one hundred and eighty pounds, for whom I had administered gas four or five times previously, presented for the extraction of two teeth. I administered gas and performed the necessary operation, the patient returning to consciousness normally. He rinsed his mouth, rose from the chair and walked across the room to the washstand about ten feet away, filled the water-glass and returned to the chair; all this time I was carrying on a conversation with him, not thinking that there could be anything wrong. He waited in the chair for twenty or twenty-five minutes, and after the bleeding ceased, he went to the mirror and put his hand to his mouth, but his hand came down like this [illustrating]. He said to me, "John, that hand seems numb." He looked a little pale, but went home a few minutes afterward, saying that he was feeling all right, but he died that afternoon. This was not a case of death from nitrous oxid, nor was the nitrous oxid any more responsible than any other excitement may have been.

This recalls to me another case: A man desired an operation performed under gas, and who, I saw, was not in good condition. I told him to have his physician examine him, and if he still wished to have the operation performed and his physician gave his authorization, to come back the next day. The following day I received word that the man had died at ten o'clock that night.

There is one point that I would like to speak of, that is, the history of nitrous oxid anesthesia. We all give credit for the discovery of nitrous oxid anesthesia to Horace Wells, we credit Dr. Morton with the discovery of the anesthetic properties of ether, and Dr. J. Y. Simpson of Edinburgh with the discovery of the anesthetic properties of chloroform. In a book published in 1894, which contains an account of the fiftieth anniversary of the discovery of anesthesia, celebrated in this city, these facts are on record. I want to mention this because history, as we understand it, is being placed in jeopardy. It is now twenty years since the celebration referred to, and in five years more it will be time to celebrate the seventy-fifth anniversary of the discovery of anesthesia, and it would be well for this and the National society to celebrate this event. Then we should put our shoulders to the wheel to have a statue placed in the Hall of Fame in New York city in memory of the discovery of anesthesia by Horace Wells. The reason why I am calling attention to this is that recently the credit for the discovery of anesthesia has been given to Dr. Long of Georgia, and the University of Pennsylvania has placed a memorial tablet on one of its buildings in memory of Dr. Long as the discoverer of anesthesia. I will read to you what was said in the history mentioned in regard to Dr. Long: "Dr. Crawford W. Long of Georgia used ether for anesthetic purposes three times during 1842 to '43, and now appears as a claimant to the discovery. But Dr. Long's connection with the subject was not mentioned until many years after the fact. He did not write a word in regard to his discovery, nor did any notice of it appear in print until 1849, five years after Wells' discovery, and seven years after he himself had administered the ether. How could anyone, after knowing of such a boon to suffering humanity, resist for even a day the impulse to 'fly on joyful wings, cleaving the sky,' to proclaim the coming of this great consolation to the afflicted?" Dr. R. M. Hodges wrote of this claim, "Not a physician or surgeon ever used ether because Long had used it; nor did mankind learn from him that anesthetic inhalation for surgical purposes was possible. His claim was made after the fact, and resting on no better foundation that those claims similarly made by other aspirants for distinction, a class

so numerous as to have been named by the London *Lancet* 'The class of jump-up-behinders.'" I speak of that, because I do not wish someone else to have the great honor which belongs to Horace Wells and to Morton. Dr. DeLong spoke of this, and I hope that some method or plan will be adopted by which we can definitely place the honor for this discovery where it belongs. A movement has been talked of, but it has not yet taken definite form. In Washington we have put in the hall of the army and navy medical museum a beautiful bust of Horace Wells in memory of his great discovery.

Dr. DeLong (closing the discussion). It is hardly necessary to say much in closing the discussion. My desire and my anticipations have been realized, that is, that I might be able to say something that would produce a discussion, which it has done, a discussion more interesting and more satisfying than the paper itself. I was particularly anxious to make this paper short, as I anticipated a good discussion because of the interest that is being manifested in this subject; and because of my efforts at brevity, I may possibly not have been as plain in my statements as I otherwise should have been.

I am sure that Dr. Riethmüller has misunderstood me when he found objection to my saying that nitrous oxid and oxygen anesthesia is the method *par excellence* in practically every case, and that its application is never followed by bad after-effects. When I made that statement, I had in mind cases where it is indicated. When I spoke about pseudo-teachers I did not have in mind teachers in the dental colleges; I had not in mind anybody who would in the spirit of true professionalism give postgraduate courses. I approve most heartily of postgraduate courses. I would, however, rather see them conducted in dental schools than by itinerant teachers. What I had in mind was the attempt to increase one's fees by means of a special method or machine instead of giving it in the open and charging a proper fee for the work. I love the almighty dollar as well as anybody, and I respect every man who gets a big fee; and I also realize that we are underpaid as a profession; but let us raise our fees openly, and not hide back of a method and say that because we are using a method or machine which our fellow practitioner does not use we ought to have a better fee. It was in that spirit that my statements were made; and because I feel strongly about this matter I used strong language. It is commercializing, it is belittling the profession not to raise our fees openly, for professional services rendered, instead of because of the fact that we may be skilful manipulators of a machine.

I have no quarrel with the manufacturers. I know that they have been and are doing a great deal for the profession, but I could feel a smile going over your faces, even if I could not see it, when Dr. Riethmüller referred to the labors that the manufacturers have been engaged in toward bringing out anatomical molds of teeth. I thought we would have to ask ourselves, Who labored the harder, we dentists in inducing the manufacturers to give us anatomical molds, or they in inducing us to use them?

The Secretary read a communication from the Panama-Pacific Dental Congress Committee urging a large attendance at the congress in San Francisco.

The Secretary also read a communication from the Research Committee of the National Dental Association.

Following this, Dr. T. P. Hinman, Atlanta, Ga., vice-chairman of the Research Commission, addressed the association in regard to the work of the commission.

Motion was then made and carried to adjourn until 9.30 Thursday morning.

(To be continued.)

DENTAL SOCIETY OF THE STATE OF NEW YORK.

Forty-sixth Annual Meeting.

(Continued from vol. lvi, p. 1273.)

FRIDAY—*Afternoon Session.*

The meeting was called to order on Friday afternoon, May 15th, at 2.30 o'clock, by the president, Dr. Smith.

The first order of business for the afternoon session was the report of the Committee on Scientific Research, by the chairman, Dr. W. B. DUNNING, which was followed by a paper by Dr. WM. J. GIES, New York, entitled "The Possible Influence of Internal Secretions on the Condition of the Teeth."

[The report by Dr. Dunning and the paper by Dr. Gies, together with the discussion, will be published in a later issue of the COSMOS.]

The President then introduced Dr. HOMER C. BROWN, Columbus, Ohio, president of the National Dental Association, who addressed the society on behalf of the coming meeting of the National Dental Association to be held in Rochester.

Motion was made and carried to adjourn until the evening session.

FRIDAY—*Evening Session.*

The meeting was called to order Friday evening, May 15th, at 8 o'clock, by the president, Dr. Smith.

After the report of the Executive Council,

The next order of business was the reading of a paper by Dr. J. V. CONZETT, Dubuque, Iowa, entitled "The Technique and Relative Value of Gold Fillings and Inlays."

[This paper is printed in full at page 183 of the present issue of the COSMOS.]

Discussion.

Dr. HENRY W. GILLETT, New York. It is not easy to discuss a paper which is a statement of the best practice in any specialty. Discussion of such a paper must be largely confined to commendation, and to an emphasis of the most important items presented.

I wish to refer first to the choice of gold for cast inlays. The essayist speaks of the alloying of twenty-four karat gold and of twenty-two karat gold. I have been so well pleased with the results of the use of an alloy composed of twenty-four karat gold and at least two and one-half per cent. of platinum that I wish to call your attention thereto. This alloy seems to offer just about the right degree of resistance for occlusal surfaces, and it is sufficiently ductile to permit of satisfactory burnishing for the perfection of the margins.

Dr. Conzett referred to the argument which we hear so frequently presented, namely, one of the objections which is being constantly raised by the advocates of the foil filling is that the cast inlay requires broader cutting—greater sacrifice of tooth structure. I wish to read the paragraph in question: "The preparation of a cavity is practically the same for an inlay as for a gold filling, the only possible difference being that in the preparation for a gold filling some undercut retention is permissible, while for an inlay this is of course absolutely prohibited."

The essayist has spoken of the "saving of the teeth." Dr. Johnson used the same expression several times yesterday. I feel that it is time we should outgrow that expression and employ a broader

term. Many a tooth has been "saved" with but little advantage to the patient. It is time that we as a profession realize the saving and restoring of the efficiency of teeth, nay, the efficiency of the masticating organ, as our field. I believe we focus our attention too closely on the individual tooth, and need to study more carefully the function of the masticating organ as a unit, and the relation of the individual tooth to the whole organ. One of the marked differences between the results of foil fillings and cast inlays in cavities involving occlusal surfaces is the difference in efficiency of mastication. It is comparatively easy to restore the cusps, fossæ, sulci, and marginal ridges on which that efficiency depends, when cast inlays are used. It is not feasible within the bounds of reasonable demands upon the strength of either patient or operator to restore the enumerated features of occlusal surfaces with gold foil. The much increased efficiency of such surfaces when lost portions are replaced with duplicates normal to that case is sufficient warrant for a much freer cutting than would otherwise be permissible. If conditions are such that the removal of a foot will conserve and increase the efficiency of an individual, then it is good practice to remove it. Likewise, if the removal of a part of any tooth will be more than counterbalanced by the benefit accruing to the individual, then there is need for caution in accepting the dictum that the removal of such a part is a sacrifice.

Dr. Conzett has referred to the discrediting of inlays by reason of failure to produce creditable results, and of unseating of inlays. Inlay systems have now reached a status where no dentist can have a legitimate excuse for either kind of failure. If they occur habitually in any practice, they necessarily stamp either the practitioner's standards or his methods, or both, as inexcusably faulty. They lay upon him the responsibility of reforming one or both. Our opportunity at the present time is a broad and wonderful one, but upon us is laid the responsibility of improving that opportunity. This can only be done by maintaining our standards individually as well as collectively.

Dr. A. R. Cooke, Syracuse. The subject of cavity preparation as presented by the essayist has been so extensively discussed before this society and its component district societies that I feel unable to add much of interest. It seems to me that the theory of extension may be, and in many cases is being carried to excess. The determination of the amount of extension requisite in each individual case is a matter of judgment. Endless trouble may be entailed upon an unsuspecting public during the formation of a mature judgment by young practitioners, owing to their lack of due consideration of the vital forces of the organs upon which they are operating.

It was recently my privilege to examine a large number of specimen cavities prepared by the older students of one of our prominent dental colleges. I was impressed with the beautiful work, and admired their adherence to the principles of cavity preparation as advocated by the essayist; I noted the similarity of each case to that of its neighbor, and from the mechanical standpoint was unwilling to criticize the work. We all know that the gentlemen who have preceded me have the judgment, acquired by experience, to apply these principles successfully in their daily practices, but —like a large number of others—I find myself unable to make the extensive preparation advocated in every case without often involving the pulp, or at least endangering it from thermal shock. We shall have a reaction in this practice, as we have had in other lines, and the greatest good will be accomplished by the conservative operator.

It is a common occurrence in the practical licensing examinations conducted in this state that the candidates make unnecessary pulp exposures in the preparation of these cavities, and I have seen a large number of similar errors made by otherwise careful operators.

The passing of the use of non-cohesive gold in the form of hand-rolled cylinders

is to be deplored. Many operators of the past generation were skilled in this method, and were able to produce beautiful results in a fraction of the time required by the present system. The adaptability of this particular form of gold to the cervical wall rendered its use specially desirable, and somewhat obviated the necessity for extreme extension. The preparation and insertion of a good inlay requires as much skill and often more time than the insertion of a good gold filling, and the choice of process is dependent upon the ability of the operator to produce results. The young men of the profession are inclined to use the inlay wherever possible, whereas some of the older practitioners prefer the foil filling. My experience with the five per cent. platinum-and-gold alloy for inlays has not been entirely satisfactory. It seems to have more shrinkage than pure gold, and I have been unable to burnish the edges as closely as desired.

Dr. H. E. S. Chayes, New York. I am sorry that Dr. Conzett's effort seems to have awakened so little interest, and I am going to ask your indulgence to allow me to discuss his paper.

At the outset I may say that there is hardly anything in Dr. Conzett's paper that anyone may disagree with, but there are so many points upon which he has not touched and which he has not fully emphasized that I, as one interested in this particular branch of our work, feel it necessary to raise my voice in justice to myself and to him who is responsible for the awakening of interest in that unquestionably established treatment, namely, Dr. Taggart. Inlay work is no longer an experiment. Contrary to all expressions and belief of the older practitioners that there is still a great deal of room left for malleted gold fillings, these men will find themselves in a gradually but constantly diminishing minority, and the quicker they recognize that fact and begin to master the technique of inlay work, until they have almost eliminated from their practices that long-hailed and much-worshipped material, the gold foil filling, the better it will be for their patients and themselves. Perfection means one thing and one thing only—*perfection*. The insertion of an inlay the margins of which it has not been found necessary to burnish, if the cavity has been properly prepared and every step has been followed according to the principles laid down by Taggart six or seven years ago—which it has not yet been found necessary to change in order to render them more perfect—will fill every demand of every sincere operator who works for the interest of his patients. The softening of the wax in water at from 140° to 148° F., and the force exerted in holding the wax within a cavity in order to overcome the molecular tendency of the wax toward changing when once forced into position will be sufficient to remove the bugbear so much talked about in journals, namely, the shrinkage and expansion of wax, which cause microscopical changes in the inlay. The selection of a proper investing compound, the proper temperature and quantity of water, the taking into account of the humidity of the atmosphere, the proper mixture and the careful application of a creamy mixture of investment compound to every part of the wax model, care in eliminating air-bubbles, and finally the proper drying-out and heating of the investment, the proper burning-out of the wax within the flask, and finally casting in a cold mold, as mentioned by Dr. Conzett and repeatedly referred to by Dr. Taggart, will eliminate the myriads of difficulties which some operators have made for themselves by not following a proper technique. It is a peculiarity of the human mind that the moment anything new is offered, it is immediately opposed. We should first fairly and calmly investigate the merits of an innovation, and not until we have studied its possibilities are we justified in either adopting or discarding it. It is hardly possible that when a man offers to a scientific body some thought upon which he has spent years of careful study, we shall be able in a moment to pass a verdict upon its value. As an illustration, the author of the paper preceding the one under discussion pointed out the close interde-

pendence and relationship between the functions of all organs in the human body. The dentist places an inanimate appliance in a vital environment with the expectation that it will take a part in the maintenance and preservation of the vital organism. He must therefore exercise extreme care in all such operations. It is impossible to judge hastily a method as being defective which has been evolved by a man who has spent a lifetime in perfecting it. Such a method must be religiously followed step by step, in order to insure perfect results.

Not so long ago, railroad tracks were laid in short sections, bolted together in such a manner as to leave room for the shrinkage and expansion of the metal. This method has been abandoned, because it was found that, if the holding force is sufficiently strong, the tendency to linear change in the rails can be overcome. In other words, there is no force that cannot be overcome by a greater force. Thus we can overcome the shrinkage of gold by applying sufficient pressure to overcome it; this pressure, of course, must not be so excessive as to force the investment apart, but just enough to overcome the tendency of the gold to shrink. The addition of two and one-half per cent. platinum to pure gold is a good suggestion. Platinum can be combined with gold up to ten per cent. of platinum, if the work is done carefully and impurities are kept out.

Dr. W. A. Price, Cleveland, Ohio. I rather fear to discuss this question, because I know my weakness when I get to speaking on a physical problem like the one under discussion. I am reminded of an incident which happened in Washington a few years ago, when the famous Dr. Murray, who corrected the atomic weight of hydrogen, was working in the department of Weights and Measures. Someone inquired if he could furnish from that department a ruler that would be absolutely straight; that he wanted it as soon as possible, and asked what the cost would be, etc. Dr. Murray replied that a ruler could be made accurate to one-tenth of a millimeter for the distance of one-fourth of a meter, that the expense would be practically eleven hundred dollars, and it would require about two years to make it. The man wrote back that he wanted just a good straight ruler. This simply showed that the man had no conception of what the word "perfect" means. Speaking of relative exactness, we have a number of men in our part of the country who have the confidence that they do things to the absolute gage, and they use the words "absolute" and "exact," etc., with great confidence and freedom. It has been not unusual to hear men make the statement that they could cast a crown base that would absolutely fit. I have had the privilege of working out the physical determinations of wax and gold, and found that absolutely accurate reproductions could not be made. As a result of these findings, a series of tests were made by different members of the profession, and a prize of one hundred and fifty dollars was offered by me for any member of the profession who would produce a cast restoration which would go to place within one-fiftieth of an inch. The form that was provided consisted of a taper column one-fourth of an inch in diameter, the taper of the sides to be one per cent. per inch with respect to a perpendicular. This form was expected to reproduce, approximately, the conditions that obtained when casting a gold base for a molar porcelain crown where the gold extended over the bevel of the porcelain as well as over a bevel on the roots. This condition provided for the reproduction of both an inside and outside dimension at the same time. The outside dimension, represented by the periphery of the root and the base of the porcelain, was represented by the taper column, the inside dimensions being the pulp chamber and post-hole in the porcelain. A number of restorations were made for this form by operators living in different parts of the country. The conditions for securing the prize required that the ring go to place over the outside dimensions and in the inside dimensions of this form to within one-fiftieth of an inch; but the competitors' attempts failed. What was the reason? It soon

became evident that defects due to human error appeared in the restoration, and the men who used a cold investment and obtained by that means abnormal contraction of the wax, had their inlay stand that much higher than the form for which it was made, and we could every time, by adding the contraction of gold, viz, 2.2 per cent. to the manipulation of a given wax, tell what procedure had been used, and it always added up accurately mathematically. A definite amount of contraction always occurs in the cooling of gold, viz, about twelve per cent. of its volume from the molten state to room temperature, but about five per cent. of this contraction occurs at a certain point in the change of temperature by less than one degree. The larger part, therefore of the contraction of gold from its crystallizing point to normal temperature amounts to about seven per cent. of its volume, or 2.2 per cent. linear. It is this large fixed error, due to the contraction of the gold after it leaves the molten state, which presents the greatest difficulty for which we have been seeking to find a solution. Since the contraction of gold is a constant factor and of a definite amount, we may systematically introduce an error which will precisely compensate for the contraction of the gold, and this can be done by the manipulation of the wax pattern. By certain manipulation enough expansion can be produced in almost any wax on the market to compensate for the contraction of the gold. By warming the wax its elasticity is released, and an error in expansion is created sufficient to overcome the contraction of the gold.

A little experiment will show very clearly the effect which the elasticity of the wax may have on the finished inlay. Two pieces of inlay wax are placed in warm water and heated to their low working range. One of the pieces is removed, stretched and plunged into cold water to chill, thereby retaining its elasticity. The other piece is condensed by pushing it together endwise and chilled. While it is cold, a section one inch long is cut from each of the pieces and attached to a sprue; then investment is mixed with water of the temperature of the high-working range for the wax used, and the piece is invested. The warm investment releases the elasticity of the two wax pieces like the thawing of a frozen stretched rubber band. Each relaxes to its normal molecular state of rest, the elongated one shortening, and the shortened one elongating. This change in the wax after it is invested is prevented by releasing that elasticity while the wax is in the form, the procedure being as follows: When we make a mesio-occlusal-distal pattern and chill it in the cavity, the wax contracts, and, being held, takes on a condition of elastic strain. If this pattern is removed from the form or tooth, after being chilled, and we undertake to introduce an expansion sufficient to overcome the contraction of the gold, the warming of the pattern releases this elasticity and produces a distortion. If, however, we remove the wax while it is warm and place it in cold water, producing a contraction without strain, it does not take on an elastic stress. It would, however, be too small to go back into position in the form or tooth. If now we break it across the occlusal surface while keeping it chilled, and replace it in the form, we will have quite a wide crack between the broken surfaces. We then take a wedge of new wax and force it into this opening, after softening the edges with a warm instrument. This will introduce enough new wax in that particular part which has to do with our outside dimensions, so that, when the pattern is removed and invested in a warm investment, the temperature of which is dependent upon the formula of the pattern material, we produce sufficient expansion of the mass of wax so that it will readily go over the outside dimensions.

Another suitable method consists, instead of breaking the pattern, in cutting it across the occlusal surface with a sharp knife in one or two places before chilling it in the tooth, thereby allowing the contraction to express itself at the point of separation; after producing the contraction, we insert additional wax as before. This will introduce an expansion correc-

tion in the wax which will be more than sufficient to compensate for the fixed contraction of the gold.

Another method consists in putting into the occlusal portion of the wax pattern a metal that has a low coefficient of expansion, viz, one-quarter of that of gold.

These are some of the methods by which we can control a large part of the error observed in mesio-occluso-distal fillings due to the expansion and contraction of the wax and gold. It is therefore very necessary to know exactly the expansion and contraction at various temperatures of the particular wax used, and to manipulate it so as to introduce just the proper amount of expansion to overcome the contraction of the gold.

Dr. CONZETT (closing the discussion). I wish to thank you for the very kind reception accorded to my paper, which is confessedly incomplete, as it was absolutely impossible in the time at my disposal to cover the subject. That is the reason why I have not gone into detail in regard to some of the points mentioned by Dr. Chayes, and which must be carried in mind in any inlay technique and cavity preparation. I was glad that Dr. Gillett emphasized the restoration of the function of the tooth. A filling or an inlay which reproduces lost tooth tissue and does not perfectly reproduce the function of that tooth is a failure. I have frequently removed fillings that seemed perfect except that they did not restore the mesio-distal diameter of the tooth, hence did not restore the function of the tooth, and in order to correct such defects I have removed fillings apparently perfect in every respect, inasmuch as they prevented recurrent caries. The restoration of sulci and cusps is more easily made in an inlay than in a gold filling. In regard to the question of extension for prevention, operators who are cutting teeth all to pieces are not following Dr. Black, and the operator who exposes a pulp in making an extension is lacking in skill. The extension is not made toward the pulp of the tooth, but in the surface of the tooth.

I do not wish to go into the question of the expansion of wax, but, as Dr. Price says, the factors of expansion and contraction can be controlled largely. I wish to join Dr. Chayes in his tribute to the genius who brought out the cast inlay. It is almost impossible for us to appreciate the tremendous amount of work which Dr. Taggart has done in this field. He made magnificent inlays when the method was first brought out, and those practitioners who are carefully following his technique are making magnificent inlays today. So many are casting in hot molds, using an investment material which is disintegrated, and instead of controlling the expansion and contraction get a breaking-up of the investment material and a distortion of the inlay. If the wax is properly introduced into the cavity, as Dr. Price has said, and if the inlay is cast in the mold at the proper temperature, there will be a shrinkage in the gold that we cannot get away from, but which we can overcome. I have demonstrated that for one and the same model, we can make with the same wax one inlay that will rattle, and another inlay that cannot be forced into the cavity because of the expansion of the gold, the difference being due simply to the different temperatures of the flasks in the casting.

The next order of business was the Report of the Correspondent, Dr. E. B. PRENTISS—viz, "Nitrous Oxid Analgesia in General Dental Practice"—which was read by Dr. Hasbrouck.

[This paper is printed in full at page 156 of the present issue of the COSMOS.]

Discussion.

Dr. JAMES F. HASBROUCK, New York, N. Y. I have read the report of our Correspondent with a great deal of interest. There is unquestionably, at the present time, a feeling of uncertainty as to the practical value of nitrous oxid and oxygen as used by the general practitioner for producing analgesia during dental operations. I am not prepared to commend its use as an analgesic pure

and simple—my own experience, comprising a rather long series of cases, being that whenever any part of the operation would really produce actual pain, the only method of eliminating shock is the induction of anesthesia. Analgesia may be excellent in selected cases; we are perfectly willing to accept the statements of those who report this, but I should like to know whether or not, at critical moments during their operations, anesthesia is not induced. Should nitrous oxid and oxygen form part of every dentist's equipment? This is a different question. Offhand, one would be tempted to answer Yes, but we must make so many qualifications that my answer would be No—excepting that I believe Dr. Hartzell is entirely correct in his statement that the equipment should be in the office of every man who is capable of using it and who has work demanding its use.

Observing the data at hand, there seems to be a unanimity of opinion regarding the qualifications of the administrator of nitrous oxid and oxygen. I am quite in accord with this opinion, and believe that one should receive special instruction from one qualified to teach, and by this I mean to imply that I do not consider a demonstration or two by the exploiters of an apparatus sufficient for this purpose. A trained and experienced assistant should always be present. I know that many will think that all of this preliminary preparation is unnecessary, but as one acquires experience in the administration of these gases, I think he will agree with Dr. Connell's statement that nitrous oxid and oxygen in unskilled hands is more dangerous than either ether or chloroform. It is not the easy cases that we are here to discuss—they will take care of themselves; anyone can handle an easy case. But the difficult cases are exasperating, and we seldom know beforehand when complications will arise. It is the emergency which we must provide for; therefore I should strongly advise against adopting the use of this method either without proper instruction or without having a trained assistant.

Patients do experience unpleasant effects at times from the use of nitrous oxid and oxygen; headache, general weakness, and nausea many times, in longer operations particularly. In all operations which are to consume more than a few minutes of time, I should advise preparation of the patient as for a major anesthesia, and by so doing much embarrassment may be saved to all concerned. I have prepared a clinical statement based upon 1200 consecutive administrations of nitrous oxid and oxygen, as follows:

Total cases—nasal method, 1200.

Estimated average duration of anesthesia, 10 minutes, the duration of the anesthesia in individual cases being from 3 to 50 minutes.

Ages of patients, from 3 to 85 years.

Nausea during or after anesthesia, 20 per cent.

Hysteria after anesthesia, 4 per cent.

Patients difficult to control under the anesthetic, due either to non-susceptibility to nitrous oxid or extreme susceptibility to both gases, 7 per cent.

Bad breathers, 4 per cent.

Heart involvement during anesthesia (syncope), 3 in 1200 cases.

Spasm of glottis, 1 in 1200 cases.

Dr. Hertz seems to have dealt with the problem most satisfactorily. His answer to question No. 2, concerning the perfection of equipment, does not altogether agree with my experience, since up to the present time I have been unable to find a fixed point for any patient at which either analgesia or anesthesia may be evenly maintained; in other words, that point will not *stay* fixed. We may have an approximate point, but owing to variable outside influences this point will vary, and only by constant care and attention can this variation be followed so that the patient's condition will remain even.

Much is still to be desired in the way of perfection of apparatus, although the machines are being improved from year to year. The perfect machine should be capable of delivering the gases under the most accurate adjustment as to volume and pressure, and the mechan-

ism necessary to accomplish this result should be of the simplest description.

It is apparent that, in order to obtain the best result, a fine adjustment of the mixture is necessary, also very close observation of the patient during the operation. The important point to be considered is that in all mouth operations, whenever the gases are administered nasally, a variable factor is introduced, namely, the amount of air entering the lungs through the mouth, which may or may not be excluded, depending upon one's technique. There is always more or less manipulation of the cheeks, tongue, and fauces, but in many cases the admission of air is reduced to the minimum, in anesthesia, by packing the pharynx with gauze; in analgesia, however, this packing might not be tolerated, and the varying pressure at the mouth must be met by changing the proportion of the mixture and readjusting the pressure, which cannot easily be done by the operator unless a skilled assistant be present.

One's success with this method is going to vary considerably, depending upon several factors, the most important of which are the condition of the patient, both mental and physical, control of the patient by the operator—and here we might mention his psychic or suggestive influence—and finally, perfection of one's technique in administering the anesthetic.

Dr. W. D. Tracy, New York. In these times of transition and rapid development a report such as the one submitted by our Correspondent is of inestimable value.

The subject with which it deals seems to be paramount in the dental mind throughout the country, and the facts concerning the use and advantage of analgesia, coupled with a statement of the disadvantages and dangers connected with the administration of nitrous oxid and oxygen, will be of great help to many who are endeavoring to decide in their own minds the true status of analgesia in its present stage of development.

The numbered questions propounded by the Correspondent have been so splendidly answered by so many men of high scientific achievement that I will not attempt to discuss them further. The word of caution as found in the letter over the signature of Dr. Gillett is worthy of emphasis, and I trust that the warning will not be unheeded by those who are tempted to jump into a field of work for which so few general practitioners are qualified by experience or education.

Dr. Prentiss has asked me to say something from the viewpoint of the general practitioner concerning the danger of too deep cutting or possible injury to the dental pulp during cavity preparation under analgesia. It is my opinion that before analgesia is begun, a careful diagnosis of the general condition of the individual tooth and those adjacent to it should be made. If there is any element of doubt concerning the condition of the pulp or of the pericemental membrane, the usual methods of reaching a definite conclusion should be used prior to the administration of the nitrous oxid. From my own experience and observation there seems to be no more danger of unintentional exposure of a dental pulp under analgesia than there is without it, when the work is being done by the hand of a careful operator who understands dental anatomy and pays heed to his knowledge of that important factor. It is my belief that dentin is even more sensitive where it joins the enamel than it is oftentimes in the deeper portion of a cavity, and with the present-day apparatus of the best type, which secures and maintains a definite mixture of the gases used, there is no need for undue haste in removing deep-seated carious portions of dentin. If the removal of carious dentin leads to actual exposure of the pulp, as it must in many instances, no matter whether analgesia is used or not, the patient who is in an analgesic state is in an excellent condition for the application of pressure anesthesia. As soon as the application of novocain under pressure has been completed, the inhaler is removed and the work is thus effected

with a minimum of discomfort to the patient. If, in certain cases, the patient's sensation of pain is desired by the operator as a help in diagnosing conditions during the progress of his work, a slight analgesia will permit him to have the intelligent co-operation of his patient, and at the same time will securely protect the patient from that kind of pain which is declared by some to be "simply unbearable;" but such conditions do not often prevail in my own work.

While we cannot work under any fixed rule, it seems to me the general principle under which we proceed in preparing cavities is simply to lay our cavity margins in areas of immunity, gaining proper resistance from an adequate retentive form and the necessary removal of carious dentin. I do not see why the use of analgesia should in any sense interfere with an intelligent diagnosis of all these requirements, and in many instances analgesia is of great assistance in permitting the operator to proceed, not in the direction of least resistance, which would lead to an improperly prepared cavity because of his desire to spare the patient, but analgesia enables him to make a perfect operation.

I wish to revert a moment to Dr. Gillett's comment that "The present interest in the practice is largely commercial." This we acknowledge to be true, but it is true only because the dental profession has made it possible. Dentists for years have threaded their way through a maze of obtundents seeking to find some panacea for sensitive dentin, and now we are lost in the labyrinth of analgesia, anesthesia, conductive anesthesia, etc. There is an insistent demand on the part of the public, and a persistent desire on the part of the dental profession, that the pain necessarily incident to the performance of dental operations be reduced to a minimum, and if possible altogether eliminated. Analgesia has been a step in this direction, but admittedly falls far short of the desideratum, for the many reasons mentioned in this report. But until something better is presented, many operators will continue to find help from its use. There is, however, some light on the horizon; it may be that local and conductive anesthesia, produced by the injection of novocain, will be the next step in advance, though no man can come forward to say that this method is not beset with great drawbacks and grave dangers.

As far as the outlay of money for new and untried appliances and the building-up of a junk-heap is concerned, I freely charge such money to the cost of my education and advancement, and have just ordered a complete outfit of local anesthesia instruments and accessories. We must try the new ideas that are presented to us in order to prove or disprove the merits that are claimed for them.

Dr. Henry W. Gillett, New York. I would like to say a word or two in addition to what was said in the report. After I had sent my letter to Dr. Prentiss, as read by Dr. Hasbrouck, I had a talk with Dr. Thomas Bennett of New York, who is, if not the leading, one of the leading specialists in anesthesia in New York City. Following this conversation, I sent him a copy of the letter Dr. Hasbrouck read to you, and later called him up and asked for his opinion concerning it. He indorsed the letter with enthusiasm, saying that he felt it was an excellent statement of the situation. In talking with him I gained some further impressions of his own viewpoint, as, for instance, that he considers nitrous oxid and oxygen one of the most dangerous anesthetics in use. After an observation of four hundred cases, he has limited his use of it to a small and carefully selected class of cases.

In the May 1914 issue of the Dental Cosmos there appeared in the Review of Current Literature, on page 628, a review of an article by Dr. A. H. Miller on "Gas-Oxygen Anesthesia," in which the writer calls attention to a number of contra-indications to nitrous oxid and

oxygen. There is also included in this article a list of deaths ascribed by the compilers of the list to nitrous oxid and oxygen anesthesia, as follows: Teter, 21; Crile, 2; Lydston, 3; Allen, 29; Gatch, 15; Olow, 6; Boys, 7; Miller, 8; Flagg, 9; Salzer, 11; Collins, 12; Buchanan, 13. I think that is sufficient comment concerning the safety of nitrous oxid and oxygen anesthesia and analgesia apparatus.

The next order of business was the installation of the newly elected president, Dr. A. M. Wright, Troy, N. Y.

Dr. A. P. Burkhart moved that a rising vote of thanks be extended to Dr. Smith, the retiring president.

The motion was unanimously carried, and the society extended a rising vote of thanks to Dr. Smith.

(To be continued.)

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

Regular Monthly Meeting, held October 27, 1914.

The regular monthly meeting of the Academy of Stomatology was called to order Tuesday evening, October 27, 1914, at eight o'clock, by the president, Dr. J. V. Mershon.

The essayist of the evening, Dr. Hermann Prinz, Philadelphia, was introduced by the president, and read a paper entitled "Radio-active Substances and Their Therapeutic Application in Dentistry."

[This paper is printed in full at page 150 of the present issue of the Cosmos.]

Discussion.

W. S. Newcomet, M.D., Philadelphia. When Dr. Guilford asked me to discuss this paper, his invitation was accepted with the idea of my not missing any paper on radium, for the reason that I am particularly interested in this subject. After consenting, I began to reflect that my knowledge of dentistry was limited to the experience of pulling teeth while an interne in the hospital; so, to bridge over this difficulty, I concluded that the exhibition of some borderline cases between dentistry and medicine might be profitable.

For instance, leukoplakia is a disease which concerns you as much as it does medical men, and the dentist is really more likely to apply caustics than his brother in the medical profession. Dr. Hartzell, at one of our meetings, said that the medical man who cauterizes leukoplakia should be put in the penitentiary; I will leave it to you, gentlemen, to say what should be done to the dentist who does so.

Those of us who have been working with the X ray and radium for a number of years have observed many changes; some have been able to produce results, while others have failed. You may recall that when X rays were first employed in medicine it was not unusual for many surgeons to assign the operating of these machines to inexperienced nurses. This procedure was continued until many severe burns gave timely warning that the X rays should be handled by men who are specialists in their application.

When radium was first discovered, many surgeons implanted it in various tumors and experimented with it along divers lines; it shortly fell into disuse, however, for want of satisfactory results, regaining favor only when one of our eminent surgeons in the United States

took up the question of radium, and gave it sufficient time and study to establish it as a determining issue. While his work has been opposed, it has been of great scientific value. Few persons seem to realize the actual worth of radium, and with that fact in view, these cases are presented for consideration.

(Dr. Newcomet then presented several patients, among them (1) a case of leukoplakia, (2) one of carcinoma of the palate, (3) carcinoma of the buccal mucous membrane perforating the cheek, (4) osteosarcoma of the jaw, (5) lupus of the palate, and (6) sarcoma of the tonsil.)

There is no doubt that this subject is of more interest to those handling radium than to the observer. When one has been studying these cases for two or three years, some pride must be felt in their recovery, and a pleasure in making some reference to them.

I quite agree with the essayist in regard to the newer methods being recommended, and commend him for his remarks upon the use of radium in rheumatism and gout, for you all know the long list of short-lived remedies for this trouble. It is possible that radium in the treatment of pyorrhea may be consigned to the same position.

Some exception must be taken to the essayist's comparison of radium and thorium. Beginning with uranium, we have an element which disintegrates into uranium I, II, and uranium X, and has a life of about eight billion years. Ordinary uranium dissolved in water to which is added a small quantity of iron chlorid, then precipitated with ammonia, will separate the uranium X, which has a life of about thirty-five days, and gives off the alpha with weak beta and gamma rays. After the uranium series follows another disintegration, and we have ionium, with a life of two hundred thousand years. Ionium disintegrates into the substance now well known, radium, which has a natural life of about two thousand years. While everyone knows of radium, it is not the useful therapeutic agent it is generally supposed to be. Radium, in itself, is absolutely useless in therapeutics, but it gives off a small alpha and possibly beta ray. The emanation is the next product, and has an active life of four and one-half days; this is a gas, and it is confusing to speak of the emanations from radium in connection with the alpha, beta, and gamma rays. This gas has been named *niton* by Dr. Rutherford. It has an active life of about four days, disintegrating into radium A, B, C, and it is here where we find a useful activity from a therapeutic standpoint. Radium C is divided into C′ and C″, disintegrates rapidly, and from it are obtained the powerful gamma rays. Following this series of rapid disintegration, we have the first of the series of slow disintegration, which is radium D, or radio-lead. This explains the activity of the average lead, which must be kept years before it can be used to make the electroscope of which the essayist spoke. After radium D, we have radium E, and radium F, which is polonium, and then possibly the series ends in lead.

In considering thorium, we have an irregular grouping, as follows: Thorium, life three million years; mesothorium, 5.5 years; mesothorium II, about six hours; radio-thorium, two years; thorium X, 3.6 days; thorium emanation, 50 seconds; we then have thorium A, B, C, D. The essayist calls attention to the fact that we cannot use thorium, at least when it comes to the use of its emanation. The reason for this is that thorium emanation disintegrates in a few seconds.

The emanation of radium in water—radio-active waters—has a life of about four days, and explains why we may have radio-active waters from radium, but not from thorium, the latter requiring continuous preparation. In London and Boston there are hospitals making use of this process and giving the preference to the emanation rather than to radium as radium, the reason assigned being the tremendous amount of energy capable of being confined in a small amount of space.

If one desires the emanation in natural mineral waters for use in the mouth,

as the essayist mentions, in the form of mouth-washes, and advocates such performances as described, I would relate to him a story which was recounted a few days ago: A woman said she had purchased a large bottle of hydrogen peroxid at a department store for fifteen cents, whereas her daughter had previously paid twenty-five cents for a small bottle at the drug store. No doubt both obtained peroxid of hydrogen. The same is true of radium emanation. There are very few waters that do not contain radium emanation. But is it of medical value? Furthermore, as a solution, radium emanation is very unstable. It has been calculated that, in being poured from one vessel to another, the water will lose from ten to thirty per cent. of its emanation. If the loss is so great from such a slight manipulation, it is reasonable to believe that a much greater loss would occur from rinsing or washing the mouth.

The emanation of radium has been introduced into wax and other substances for filling teeth, but the fact that we are dealing with the most fickle substance known precludes the idea of retaining its radio-activity. It should be remembered that some of the elements change in the fraction of a second, and yet they are recommended for use in the filling of teeth!

Dr. R. H. Riethmüller, Philadelphia. In these days, when some of us think that the Germans are not receiving their full dues, I wish to report that in 1900, one full year before Curie started to manufacture or even make experiments with radium, a dentist—and I think we as dentists should be proud of this fact—Professor Walkhoff of Munich, in co-operation with Prof. Dr. Giesel of Braunschweig, manufactured the first appreciable quantity of radium from pitchblende and published their results.* I think this should be marked in history, because a great many other discoveries have been appropriated by individuals of piratical tendencies. I only have to mention the wireless telegraph, which was by no means invented by the men who were shrewd enough to exploit it commercially. A great many other inventions and discoveries have been made without the originator receiving the credit due for his work.

I have been interested, during the last few years, in reading a great many articles on radium therapy in dentistry, and the names which Dr. Prinz has mentioned have become familiar to the zealous reader. In fourteen or fifteen articles reviewed in the Dental Cosmos, the results of radium therapy in dentistry which Dr. Prinz has so ably reported to us tonight have been verified, that is to say, radium is by no means the panacea which it was hailed to be by its first advocates.

It was interesting to me to note the cases presented by Dr. Newcomet which have been under successful treatment by radium emanation. In the case of the woman who was being treated for leukoplakia, I think every dentist would first extract that second molar root in that suspicious area which has not yielded to radium treatment, and which will probably not yield until that diseased root, which must be causing a great deal of irritation, shall have been removed.

Dr. P. B. McCullough, Philadelphia. Dr. Newcomet, in closing, may explain why the physiological effects of radium application were so bad in the early period when this agent was not so well known. Dr. Newcomet will probably recall the case of a superintendent of a hospital who was afterward operated upon for carcinoma of the lower jaw after having been previously treated with radium. The report which I received stated that his death was not due to kidney failure, heart failure, shock of the operation, or anything that occurred immediately before or as a consequence of the operation that could be directly held responsible for his death. He died of what the surgeon characterized as dissolution similar to another disease the etiology of which is not known; disso-

* See Dental Cosmos, November 1913, p. 1192, review of seven papers on "Radium in Dentistry."

lution of the entire system, under which he declined very rapidly, and the customary treatments which were resorted to at that time had no effect. I hope that I make my point clear. It was assumed that too long application of radium had produced an entire change in the animal cell, affecting the entire constitution, and precipitating a death that might have been avoided if the operation had been performed without radium treatment.

Dr. Newcomet. In regard to cases of brain tumors, several cases have come under observation, but in only one was the result favorable. This young man [presenting a patient] was presented before a medical society about a year ago, and he is still in good health. From this little group of favorable cases presented tonight the impression must not be gained that such results occur in all persons treated with radium. You must be reminded that in these instances the condition is desperate, and usually terminates fatally. Possibly only five or ten per cent. of these cases are restored to health, and it can be safely said that, so far, no cure for cancer has been found.

Dr. McCullough's reference to a certain case is sufficient proof of the above assertion. While the application of radium failed to check the disease in that case, it can hardly be said to have produced any influence which hastened the end. Under certain conditions, however, radium may be the cause of a violent reaction which may lead to trouble. One such instance occurred in a case of cancer of the tongue. This patient had been treated in Germany as well as in this country. He would not submit to a radical operation, and finally radium was applied. After a few treatments his tongue became swollen; this was followed by a cellulitis of the neck, and finally a septic pneumonia was too much for his greatly burdened system. These are a few of the unfortunate cases which come under observation. Other cases could be mentioned that have received treatment here and elsewhere. The disease has but one issue, and when we save *one* from its natural course, a just pride can be taken in the recovery of such a case.

It was most curious to see how cellulitis follows the reaction from radium in some cases. This is not observed as a reaction to the X ray. On the other hand, the usual burns from radium are as a rule trifling, while the burns from the X ray are a serious matter. One of the cases presented tonight showed a well-marked burn upon the tongue, but it can be safely stated that this will heal within a few weeks. Such burns are to be regarded as accidents, and indicate clearly the result of inexperience and the necessity for skill in handling not only the X ray but radium as well; they undoubtedly should both be administered by a specialist.

In speaking of the physiological effects of radium treatment, we must divide the subject into two heads—(1) the effects, both local and general, from local applications, and (2) the effects, both local and general, from internal administration. This is an enormous subject. When we consider that, if radium is applied locally only nine per cent. or less of the energy is used, and, if it is employed internally, the total amount of energy is distributed over the whole body, the vastness of the subject can be easily seen, and it would be impossible to do it justice in a short space of time.

Dr. Prinz (closing the discussion). I wish to thank you heartily for the kind reception you have given me, and thank Dr. Newcomet and Dr. Riethmüller for their discussions. There would be a great deal more to say about the physics or the chemistry of radium, but in a short hour's talk this subject could hardly be treated with justice. Nevertheless, I presume we have possibly gotten some sort of impression that will help us to judge whether or not it is advisable to use radium.

Motion was made and carried to adjourn.

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Devoted to the Interests of the Profession.

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PHILADELPHIA, FEBRUARY 1915.

EDITORIAL DEPARTMENT.

THE PASSING OF THE FATHERS.

On the 27th of February, 1904, a "golden jubilee" banquet was given by the dental profession to Drs. James Truman, Louis Jack, C. Newlin Peirce, W. Storer How, and Eri W. Haines (whose portraits we publish as a group illustration in the current issue), the then surviving members of the class of 1854 of the Philadelphia College of Dental Surgery, in commemoration of the fiftieth anniversary of their graduation. An obituary notice of Dr. Louis Jack, the last surviving member of this group, also appears in the current issue. During the something more than ten years that have since elapsed all of those who were honored upon that occasion have died.

In his own way, each of these men was a notable figure in the history of dentistry. Each had contributed largely and variously to the common store of dental knowledge; each had exerted a definite influence in shaping the standards and ideals of our professional life and activities, not only in a national but to a

large degree in an international sense. At the time of their graduation dentistry as an organized profession was but fifteen years old, and but little more than the foundations of a professional organization had been laid; the superstructure was yet to be reared. The new profession, in the nature of the case, had no established precedents by which to direct its course. It was an untried thing, and because of its novelty was regarded with suspicion and distrust, especially by members of the medical profession, who were inclined at times to resent the aspirations of this new fledgling in the science and art of healing as those of an impertinent usurper. The close relationships of the art and craft of dentistry to that of the skilled artizan obscured for the time being the larger possibilities of dentistry as related to the science and art of healing, and tended to develop a spirit of commercialism which permeated in greater or less degree, with minor exceptions, the entire dental professional body. In the more than half-century which has elapsed, dentistry has developed from its humbler beginnings to the full stature of a recognized profession, and the change has been wrought out by the recognition and general acceptance of the ideals which those men of the class of 1854 of the old Philadelphia College of Dental Surgery and other seers and pioneers of the same period in that early formative stage of dentistry realized and adopted as their professional standards.

On the occasion when these men received their degrees, the honorary degree of Doctor of Dental Surgery was conferred upon John Tomes, later Sir John Tomes, of England; upon Chapin A. Harris of Baltimore, and Thomas W. Evans of Paris. It was not an empty honor that was thus conferred, nor was it intended to add luster to the reputations of the eminent recipients thereof. It signalized the appreciation which those master pioneer minds felt for the ideals and attainments of men of their own intellectual caliber, and was more particularly the mark of an effort to band together in a common brotherhood all of the leading men in the dental profession, regardless of nationality, who were representative of that faith in the future of dentistry which would, by reason of an appreciation of its greater possibilities, ultimately win for it the status which it has later achieved.

It is regrettable that while the personal influence of the lives of such men continues indefinitely to contribute to our advance-

ment, we are prone to overlook and forget in the busy activities of life the part which each has played and the debt of gratitude which we owe to them individually for the service which they have rendered. We accept the legacy, and forget the benefactor. When the real history of the growth and development of the dental profession is finally written, when the analysis is made of the factors which have contributed most largely to the growth of dentistry as a professional calling, the names most conspicuous will not be those who have perfected inventions that have facilitated operations which in their turn have made the emoluments of our calling larger, but the honor roll will be bright with the names of those fathers of our profession to whom was given the vision not only of the larger possibilities of service of which dentistry is capable, but who through their years of self-sacrifice and of devotion to professional advancement gave of the best that was in them of effort, of intelligence, and of service in promulgating the gospel of professionalism as the dental ideal, and who demonstrated the soundness of their faith in that ideal by the broad measure of success which they themselves attained;—success as teachers, success as practitioners, and above all, success as measured by the admiration, respect, and love of their colleagues.

BIBLIOGRAPHICAL.

LOCAL ANESTHESIA, ITS SCIENTIFIC BASIS AND PRACTICAL USE. By PROF. DR. HEINRICH BRAUN, Obermedizinalrat and Director of the Kgl. Hospital at Zwickau, Germany. Translated and Edited by PERCY SHIELDS, M.D., A.C.S., Cincinnati, Ohio, from the Third Revised German Edition. With 215 Illustrations in black and colors; 385 pages and Index. Philadelphia and New York: Lea & Febiger. 1914.

The editor of the first English edition of Professor Braun's work on local anesthesia says in his preface, "The writer of this work, Professor Braun, has justly been called the Father of local anesthesia." Considering the variety and extent of work done by the investigators and students of the subject of local anesthesia, one might at first be inclined to question the justice of the appellation as applied to the author of the work under consideration; but when it is realized that through the elaborate, painstaking, and scientific investigations of Professor Braun the principles and technique involved in the introduc-

tion of local anesthesia have been made safely applicable to the production of anesthesia for not only minor but capital surgical procedures—that is to say, a system of local anesthesia which has "no mortality" in its record, running into many thousands of cases, one must admit the justice as well as the propriety of regarding its author as the father, at least, of *successful* local anesthesia. Moreover, his studies on the osmatic tension of watery solutions, his determinations of the relative toxicity of cocain and its numerous substitutes, his advocacy of novocain, and his pioneer work in the admixture of the active principle of the suprarenal gland to the anesthetic solution, so essential for the phenomenal progress of local anesthesia, fully justify this honorable appellation.

Besides these studies, which eliminated the factor of mortality from local anesthesia, it is to Professor Braun that we owe the introduction of conduction anesthesia in general and major surgery, whereby the extent of the anesthetized area is greatly enlarged through the anesthetization of the main sensory nerve trunk, thus inducing anesthesia of the territory covered by its terminal distribution. But conduction anesthesia has made possible not only the enlargement of the anesthetic area with a minimum dose of the anesthetic drug; it has also practically eliminated the factor of autoinfection, a danger always present in the older methods, in which the anesthetic agent was oftentimes injected directly into an infected area.

The work of Professor Braun is a classic on the subject of which it treats. A comprehensive historical *résumé* of local anesthesia serves as an introduction to an elaborate presentation of what is now scientifically known about local anesthesia and the drugs capable of producing it; after which follows a minute and comprehensive exposition of the technique employed in the production of local anesthesia for the entire range of surgical operations.

It is surprising indeed to see the extent and character of major surgical operations that may be successfully performed under local anesthesia with the consciousness of the patient quite undisturbed.

The section related to surgical procedures involving the mouth and jaws, including as well the extraction of teeth, is extensive, and has been the fruitful stimulus to a number of notable works by dental surgeons whose supplemental labors can but reflect additional merit to this monumental work by Professor Braun. While the interest of dental practitioners and practitioners of oral surgery would be necessarily limited to the group of surgical procedures within their special field, yet no surgeon, whatever his specialty, could fail to be benefited by the comprehensive view of the whole subject which is presented in Professor Braun's work.

The English translation has been excellently done, and the text is readable and intensely interesting throughout. The typography, presswork, and other mechanical features of the American edition are fully up to the standard of the well-known publishers. It is a book which should be in the library of every progressive dental practitioner.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Deutsche Zahnaerztliche Wochenschrift*, Berlin, 1914, No. 17.]

THE EMPLOYMENT OF ALUMINUM DENTURES AND THE ATTACHMENT OF ARTIFICIAL TEETH AND GUM TO CAST PLATES. By Dr. Eugen Wünsche, Berlin.

When aluminum was used for casting purposes, as early as 1888, the metal was not as pure as it can be obtained today, and Carroll, who reported his system of casting aluminum under compressed air in the *Dental Register*, added platinum, silver, and copper to overcome the considerable contraction of the impure metal at his command. Owing to the low specific gravity of aluminum, which when cast is 2.64, when rolled 2.68, when drawn 2.70, it is necessary to exert a continuous pressure when casting in order to obtain perfect adaptation to the model.

Wünsche briefly reviews the history and metallurgy of aluminum, which today is obtained 99¾ per cent. pure. In casting, the contraction, in his opinion, is best overcome by the use of Wood's centrifugal casting apparatus, in which the pressure is uniformly maintained during the transition of the metal from the molten to the solid state, thereby insuring a close adaptation of the plate and avoiding porosity. The slight expansion of the plaster impression and the cast is counteracted by the slight contraction of the aluminum in casting. In taking the impression of the mouth, all hard portions must be carefully noted and relieved, in order to avoid pressure or rocking in the finished plate. The cast is poured in investment compound, and the plate, as well as the channels connecting it with the three sprue holes in the casting flask, is modeled in wax, which is coated with thickly mixed investment compound, and invested while on the model. After slow, gradual drying, the wax is carefully burned out, making sure that no wax vapor remains in the flask. After the molten metal has been poured into the flask, the centrifugal machine is kept in steady motion for three minutes. Wünsche employs continuous-gum work on his cast aluminum plates, building up the gum in wax on a model of investment compound, and pouring counter-dies of plaster, to be used in pressing the porcelain body after the wax has been burned out. Instead of investment compound and plaster, synthetic stone may be advantageously used for making this die and counter-dies. The porcelain body is baked to a bisque and covered with pink enamel of a lower fusing-point. The continuous-gum work is either cemented or vulcanized to the cast aluminum plate. In lower plates a lug of porcelain on either side buccally will greatly aid in retention in cases of advanced absorption of the alveolar ridge.

Wünsche claims great hygienic as well as anatomic advantages for this method. He warns against the use of hydrogen dioxid in mouth-washes, etc., in connection with aluminum prostheses. Excessive smokers sometimes complain of an insipid taste, which they attribute to the aluminum, but which may usually be ascribed to negligence in cleaning the plate.

[*New Orleans Medical and Surgical Journal*, New Orleans, November 1914.]

THE CAUSE AND CURE OF PYORRHEA ALVEOLARIS. By Dr. C. C. Bass and Dr. F. M. Johns.

[*American Journal of Clinical Medicine*, Chicago, December 1914.]

EMETIN—A "DOUBLE-BARRELED" SPECIFIC. Editorial.

In the January 1915 issue of the Dental Cosmos we have briefly noted the work of Bass and Johns, who have corroborated the

discovery of Barrett and Smith in regard to the endamœba buccalis and emetin as a specific in pyorrhea alveolaris. In the article under review the joint authors report having examined material from pyorrheal lesions in 87 cases, and having found the endamœba buccalis in 85 of them. One of the negative reports was based upon a single slide prepared at a distance from the laboratory; the other negative case was that of a thirteen-year-old child with acute gingivitis, involving all the gums, of about eight days' duration. In addition to these 86 cases in which the disease was either diagnosed by dentists or was so advanced that no mistake could be made, they have made more than a hundred examinations from apparently normal gums and teeth, either in the mouths of patients who had the disease involving other teeth, or in people who appeared to have normal gum margins. They have not been able to find amœbæ in a single such instance. They have, however, found them on several occasions in instances where the gum margin appeared inflamed, indicating an early stage of the disease. In several instances, amœbæ were found in similarly mildly inflamed and easily bleeding gum margins of one or more teeth in patients who had well-advanced pyorrhea around other teeth. Thus amœbæ have been demonstrated in all stages of the disease, from the early beginnings described to entire looseness of the teeth and total denudation of gingival tissue and alveolar process.

The writers' technique for examining the amœbæ consists in collecting material from the bottom of the lesion with a suitable instrument or toothpick, and transferring it on a slide after dilution with a little salt solution, saliva, or water. A cover glass is immediately placed on the diluted material, which is promptly examined with the high dry lens of the ordinary microscope. The amœbæ—whether there is more than one species the writers are not as yet prepared to say—show the characteristic amœboid motion, and vary in size from a leucocyte to about three or four times that size. No contractile vacuole is recognized, but nutritive particles, more refractile and prominent in appearance, are observed. The ectosarc is quite clear, and is well differentiated from the endosarc. For staining, a thin spread of scrapings and pus from the bottom of the lesion is made on a slide, allowed to dry in the air, fixed with heat, and stained with carbol-fuchsin about one-fourth minute, washed, stained with Loeffler's methylene blue about one-half minute, washed, dried, and examined. The amœbæ are well stained by this method and show their inclusions or tissue or cell remains, indicating pathogenicity. The writers have been unable to demonstrate that these amœbæ take up bacteria, though they sometimes seem to do so.

After discussing the destructive influence of the active principle of ipecac, *i.e.* emetin, which was first demonstrated by Vedder and Rogers in amœbic dysentery, the writers describe their method of applying emetin, which they do not inject into the gum and pus pockets, like Barrett and Smith, because it does not seem reasonably probable to them that all the diseased tissues can be reached in this way. They have had 68 cases under observation and treatment for from two days to two weeks, using hypodermic doses of from one-half to one grain. Only one dose was given in a day. Several cases have been given a dose daily for several days. Others were given one or more doses until the amœbæ disappeared, after which an interval was allowed to determine how long it would be before they would return, or what other results could be observed. In several instances no amœbæ could be found the next day after the first dose was given. In a few, however, they were found the next day after emetin had been given on two successive days. In no case have amœbæ been found the next day after emetin has been given on three successive days.

The studies regarding the duration of the absence of demonstrable amœbæ following three or less doses of emetin are not as yet final. In several instances, no amœbæ could be found after seven days or longer intermission of treatment. On account of the wide distribution of this amœba in nature and the character of the lesions of the disease, the writers do not think it likely that advanced cases of pyorrhea alveolaris will be permanently disinfected by a few doses of emetin given during a few days. The chances of reinfection are so great, and the damaged gum, alveolar, and tooth structure offer such favorable soil that it must surely be necessary to continue the specific treatment until nature has had time fully to heal the dis-

ease, the length of time necessary for this depending upon many factors. If the gum only is involved, the length of time probably necessary for it to heal will not exceed a week. The writers have observed great changes in forty-eight hours, and gums that bleed easily often become perfectly normal in this regard in from forty-eight to seventy-two hours. The results are so striking as to be evident both to the doctor and the patient.

The writers are certain that rapid and favorable results may be expected to follow the administration of ½ grain of emetin hydrochlorid hypodermatically in any part of the body daily for three or four days, to be repeated during one or more days after an interval of three to ten days, except in mild cases. In very bad cases, it may be found necessary to repeat treatment several times before complete recovery. Adjuvant treatment, consisting in removal of tartar, scaling, and other local dental treatment, also injection of ½ per cent. emetin into the pockets as recommended by Barrett, will favor the success of the hypodermatic treatment with emetin.

The *American Journal of Clinical Medicine*, in an enthusiastic editorial, hails the "double-barreled" specific action of emetin in tropical dysentery and in pyorrhea alveolaris, and reports that a number of cures of pyorrhea following the administration of emetin in cases which had not responded to other methods of treatment have come to their attention. In one case treated by a New York dentist virtually all the teeth were affected, the gums were spongy, the gingival pockets were exuding pus in large quantities, the teeth were loosening, and the patient's general health was very poor. After a few days' treatment with emetin, the clinical picture was changed for the better "in a manner and degree which were simply marvelous." The journal also points out that in curing pyorrhea the dentist or physician giving this treatment is undoubtedly preventing other more or less remote but crippling diseases, since it is believed that a large percentage of the chronic arthritides, arthritis deformans, for instance, are caused by pyorrhea.

[The fulness of this report appears justified by the importance of the subject no less than by some derogatory criticisms which have emanated from operators who had made but casual clinical trials, without going to the trouble of assuring their diagnosis by previous bacteriological examination or securing proper application, with certainty of correct dosage and consistence, of the emetin hydrochlorid used.]

[*British Dental Journal*, London, December 15, 1914.]

THE ACTION OF OIL OF CLOVES AND OTHER OILS ON GUTTA-PERCHA POINTS. By H. Humphry, Dartmouth.

The writer has experimented with several essential oils to determine their action upon gutta-percha, which was found to be as follows: Oil of eucalyptus and creasote dissolved the gutta-percha, oil of cinnamon and oil of cajuput caused no change, while oil of cloves caused a large increase in size in all directions. Both creasote and eucalyptus dissolved gutta-percha points in about one month, the dissolving action of the eucalyptus being quicker. Cinnamon and cajuput oils exerted no appreciable action upon the gutta-percha points after four months' immersion. In the experiments, both round and square gutta-percha points of the same size were used, controls being carefully kept aside for comparison. Each point was fitted to the cork of a bottle containing the oil, and the bottle was then inverted. Within about one month the square point of pink gutta-percha immersed in oil of cloves had doubled in size in every direction. It altered very little during the second month. Its shape had become very tortuous, while a round point of white gutta-percha showed a little greater expansion, but no loss of shape. Both points became hard and brittle. A point immersed in a very thin paste of zinc oxid, thymol, and oil of cloves showed no alteration in size within about one month; the paste however, soon set very hard.

From these experiments, the writer draws the conclusion that oil of cloves and gutta-percha form an ideal root-canal filling, if the canal is well saturated with the oil and a point of suitable size is selected. He suggests leaving a fiber of cotton saturated with oil of cloves for one day after successful pulp extirpation and root-canal treatment,

and inserting a gutta-percha point well saturated with the oil on the following day.

[While interesting, the writer's experiment is by no means conclusive, as the quantities of oil of cloves in the bottle as employed in the experiment and in the tooth respectively are not comparable, hence also the action of the oil upon the gutta-percha point.]

[*Correspondenz-Blatt für Zahnaerzte*, Berlin, 1914, No. 2.]

POTASSIUM PERMANGANATE AND ALCOHOL IN MOUTH-WASHES. By Dr. R. Klein.

As the growing appreciation of oral hygiene leads more persons to employ mouth-washes, it must not be overlooked that the process of rinsing the mouth is performed hundreds of times during the year, and the chemical reactions produced thereby, no matter how weak, may exert untoward influences by their frequent repetition. The writer describes the case of an artist who had been using "weak" potassium permanganate solutions in his dental toilet for eighteen months, with the result that his teeth showed a grayish brown discoloration, and being denuded of gingival tissue at the cervical portion of the alveolar processes, had become loose, seeming to have lost all enamel. The potassium permanganate had attacked not only the food débris, micro-organisms, etc., but also the oxidizable constituents of the teeth and the very delicate mucous membrane. Klein asserts that all alkalis in time render a tooth soft and frail; potassium permanganate is decomposed into potassium sulfate, hydrated manganese dioxid, and oxygen. Microscopically small fragments of the drug remain in the dental interstices, exerting their caustic action for days, and manganese dioxid becomes deposited upon the teeth. All efforts at removing the stains by acids are made at the expense of the matrix, the manganese dioxid, moreover, under the influence of sodium chlorid, no matter in how small quantities, giving off chlorin.

Alcohol, owing to its affinity for water, also produces deleterious influences in the mouth, as shown in acute form in arthritic alcoholics, whose teeth are denuded of gingival tissue. The alveoli and teeth lose their elasticity, are of gray color, and break easily owing to loss of lime. The topical application of strong alcohol to aching teeth by patients who hesitate to seek the dentist's services is, according to the writer's contention, responsible for the brittleness of these teeth, which frequently break in attempts at extraction. Such applications, moreover, are very deleterious to the approximating teeth.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

Section I.—*Dental Anatomy, Histology, and Physiology.*

THE AMYLOLYTIC ACTIVITY OF SALIVA. By C. Lovatt Evans, D.Sc., Institute of Physiology, University College, London.

The amylolytic activity of the mixed saliva has been studied by the author (*Journ. of Physiol.*, xliv. 191, 1912) by a method which gives accurate comparative results, and it has been shown that the action very closely resembles that of malt amylase, both as regards the products formed—maltose and stable dextrin, and afterward traces of glucose—and as regards the dynamics of the reaction. The method used has been shown to give better results than two of the commonly used methods do (*Ib.* xliv. 220, 1912). The influence of food on the amylase content has also been studied (*Biochem. Zeitschrift*, Bd. xlviii. 432, 1913); an increase in amylase has been observed after carbohydrate food, but not after protein and fat meals. The increase lasts for some hours, and the influence of psychic factors was excluded by sham meals of carbohydrate, which were without effect. The cause of the increase was shown to be an increased activity of the parotid secretion. Parotid saliva is about four times as active as the other mixed secretions of the mouth taken together. The importance of these facts in the physiology of digestion is discussed in the original paper. The author cannot agree with Pickerill that the only use

of the saliva is to remove traces of starch from the mouth and thus prevent caries ("The Prevention of Dental Caries and Oral Sepsis," 1912, p. 160). Unpublished experiments made in conjunction with Mr. A. W. Wellings failed to show any relation between amylase content and dental caries. Moreover, the saliva of many animals not liable to dental caries is free from amylase.

Section III.—*Dental Surgery and Therapeutics.*

THE TREATMENT OF SENSITIVE CAVITIES. By C. Every Brown, Dundee.

The fear of dentistry and the need of more gentle and painless methods of treating sensitive cavities have brought about new methods of doing so. Analgesia by N_2O and O is neither convenient nor necessary. The ethyl chlorid spray is very useful when immediate treatment is required.

Hypodermic injections are also very useful in certain cases.

The use of formaldehyd gas given off by paraform has the useful properties of hardening gelatin, rendering it insoluble and inflammable; it works very quickly in the teeth of young people and on carious dentin; it is very irritating if used near the pulp, therefore a good deal of judgment is required. The use of para-mono-chloro-phenol, a preparation of carbolic acid and chlorin, is non-irritating and strongly antiseptic and anodyne; it is used in cases where the caries has penetrated near the pulp. If a tooth has given sufficient pain to keep the patient awake at night it should be devitalized. The para-mono-chloro-phenol has a modifying effect on the arsenic, greatly lessening pain. The dentin of young people is much more porous than that of old dentinal tubes obliterated in old subjects.

Section IV.—*Dental Anatomy, Histology, and Physiology.*

X-RAY OBSERVATIONS ON ABSCESSES, CYSTS, AND ROOT RESECTIONS. By Conrad A. Achner, Ph.D., L.D.S.Eng.

The writer desires to emphasize the following points:

1. The great importance of X-raying every mouth in order to ascertain the condition of the alveolus and hidden abscesses.

2. The darkness of the shadow on the skiagram indicating an abscess cavity depends entirely on the depth of the bone lesion and the amount of bone still intervening between it and the film.

3. One can diagnose a cyst from a granuloma on a skiagram by the shadow being of greater density, more defined regular outline, and the tendency sometimes of displacing the neighboring teeth.

4. The great importance of removing the entire root in extractions, the scraping out of abscess cavities, or removal of granuloma in order to prevent suppuration, formation of sinuses or cysts.

5. The presence of a shadow around the root apex and the history of a sinus is sufficient to denote the presence of a granuloma.

6. The correct way of reading skiagrams enables one to determine the extent of the bone lesion, and thus prevent waste of time by treating with drugs where a radical cure ought to be performed.

7. A tooth causing an abscess cavity or a dental cyst, if otherwise in good condition, can be saved by means of apical resection.

Section V.—*Dental Prosthesis.*

REMOVABLE BRIDGE WORK AND SADDLE BRIDGES. By Dr. A. C. S. Angel, Copenhagen.

The root-canals must be easy of access, and the root as little weakened as possible. The bridges must be made so that they will fasten well and yet be easy to remove. When the bridge pillars are molars and premolars, they are cut down a little below half height, and the sides are made cylindrical—with a transverse section like that of the root. A cylindrical ring of platinum-iridium or platinum-silver, with a cover of the same material, is made to cover these and soldered to it. Over this another cylindrical platinum-iridium or platinum-silver ring is adjusted. To the exterior of the latter, on the visible side, is soldered a thin gold plate twenty-four karats fine. On the exterior ring the crown cover is cast with a buttonlike stop down to the capsule directly placed over the root. If a greater contour of the exterior capsule is required mesially or distally, a little of the upper edge is removed at this place, and the contour is restored by casting in gold on the ring together with the crown cover. When the bridge pillars are incisors and canines, a thinner platinum-iridium or platinum-silver

cap with tube fastened to it—which must not be too substantial—is used. Outside this is adjusted a platinum-iridium or platinum-silver ring a little thicker than the former. On this is soldered a cover and a pin fitting into the tube. A steel facing is now ground on in such a manner that the foremost part of the exterior cap is removed. The tooth is now standing upon the foremost edge of the interior cap, and is soldered to the exterior cap. The remainder of the foremost half-part of the ring of the exterior cap is then removed. The foremost visible part of the ring of the interior cap is covered with gold twenty-four karats fine.

These appliances were used in—I, Bridges; II, Saddle Bridges; III, In connection with Prosthesis.

EXAMPLES OF I.

(*a*) In the upper jaw, second molar and first premolar remaining in right side; and in the left side, second premolar and first molar. These are prepared with double capsules; upon this is placed a complete removable upper denture without palate.

(*b*) On the root of two canines and on two molars a complete upper denture without palate is fastened by using the different preparations of the different bridge pillars.

EXAMPLES OF II.

(*a*) Molars wanting in the upper or lower half jaw of one side. To the premolars in the same half of the jaw double capsules are adjusted. Such exterior capsules are soldered together and connected with the gold or rubber which is to replace the molars.

(*b*) In the upper jaw the two premolars and the first molar are wanting, second and third molar are prepared in same way as explained in (*a*) preceding, and connected with the gold or rubber which is to replace the teeth.

(*c*) Lower jaw. In one side molars and premolars are wanting. First premolar of the other side is shortened and covered with inside capsule. The similar outside capsule is with a bar connected with a double capsule with tube and pin of the canine on the other side, and this again connected with the denture replacing the wanting teeth.

EXAMPLES OF III.

(*a*) Lower jaw. Only two second molars, one on each side, are left. All the rest of the teeth are wanting. Double capsules. The exterior ones are connected with the denture.

(*b*) In the upper jaw are only left two incisors or canines. Double capsules with tubes and pins, the exterior ones of which are connected with an upper denture.

CASE OF ABSCESS IN THE NECK, OF DENTAL ORIGIN, CURED BY THE ANTI-STAPHYLOCOCCIC VACCINE. By Dr. B. Landete.

The case described is that of a man of thirty years, of feeble constitution, and presenting an abscess in the left side of the neck arising from periodontitis in connection with a molar. After eight or ten days of fruitless treatment by warm antiseptic bath, extraction of the tooth, and disinfection of the wound and the mouth, treatment by vaccine was proposed to him, and this gave very good results.

Four injections were applied with intervals of five days, the first injection being of half a cubic centimeter, and the last one of two cubic centimeters.

The patient felt after the first injection a great *local* and *general* reaction, as when twenty-four hours had elapsed he had an attack of fever. At the second injection he only suffered a very slight febrile attack, and this was six hours after application; during the following injections and notwithstanding the increased proportions, the patient was not in the least disturbed.

Improvement took place immediately after the second injection.

The writer is convinced that vaccines will afford excellent results in this affection.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

TOOTHACHE IN THE TOOTHLESS. By Dr. Med. Max Melchior, Chief Physician, Docent of Surgery at the School of Dentistry, Copenhagen.

It is well known that a patient may feel pain in an amputated limb, and that pain caused by a blow on the ulnar nerve is felt at the finger tips: but less is known of the toothache which is felt by the toothless, although its occurrence is not rare, and the pain is severe. The causes of trigeminal neuralgia are numerous; they may be central or peripheral, and the familiar causes of neu-

ritis, such as alcohol and syphilis, may be responsible, or the condition may be due to constipation alone, as pointed out already by Charles Bell. The condition to which the writer draws attention was described by Gross of Philadelphia in 1870, and has since been scarcely noticed. The pain is severe and obstinate, being neuralgic in character, and occurring in elderly, toothless subjects. It is situated in the remainder of the alveolar margin, or in the overlying gum, whence it radiates to the face and neck. The upper jaw is most often affected, and the area involved is usually very small. The soft tissues are less affected than in most forms of neuralgia of the jaws and face, and they may even escape entirely. When affected they are firm and adherent to the underlying bone and are cut with difficulty. The bone at the point is abnormally hard and ivory-like, and its inclusion of nerve-endings causes the pain. Excision of this bone is therefore necessary.

SECTION VIII.—*Anesthesia (General and Local).*

WHAT MEANS SHOULD BE TAKEN TO PREVENT THE OCCURRENCE OF ANESTHETIC ACCIDENTS. By J. STEWART ROSS, M.B., F.R.C.S.E., Anesthetist Edinburgh Dental Hospital, etc.

The object of this paper is to provoke a discussion upon what is certainly a matter of real public importance.

While fatalities in dental practice are not common, they do occur, and are probably nearly all preventable. So far as England and Scotland are concerned, however, the returns of the registrars-general give little help in estimating the absolute frequency, and none in fixing the percentage rate. We are therefore driven back upon general considerations.

The preventive means to which we must look appear to the writer to fall into the following groups: (*a*) legislation; (*b*) education of the dental and medical professions; (*c*) advances in scientific knowledge; (*d*) the immediate provision of some simple, safe method which can be relied upon to yield fairly uniform results in the hands of careful but not specially skilled men; (*e*) education of the public; (*f*) the evolution of specialism.

Of these, (*a*) has been unsuccessfully attempted in England, but seems to the writer to hold out no very great promise of improvement; (*c*) may of course prove of the greatest help, but cannot affect the general situation without (*b*), and perhaps the pressure of public opinion evolved by (*e*). As regards (*d*), there will no doubt be conflict of opinion as to what methods will satisfy the definition; (*f*) is always desirable, even though (*d*) were accomplished, but financial considerations will always prevent more than a small minority of patients availing themselves of the services of the specialist.

PERISCOPE.

Making Casts of Dental Pulps.—The casts produced after the methods of Preiswerk and Fischer in celluloid or low-fusing metal did not always give ideal results, as some of the canal contents were not fully reproduced. Albrecht's root-canal filling material (see "Review," DENTAL COSMOS, October 1914, p. 1192), opened the possibility of noting the relationship of the pulp to the tooth without destroying the latter. The Spalteholz method of rendering teeth transparent (see DENTAL COSMOS, April 1913, p. 374) enabled the observer to see even those spaces which had not been completely filled with the filling material, as air-filled hollow spaces of silvery luster. Moral's new method consists in introducing India ink as deeply as possible into the root-canals by means of a hypodermic syringe, the ink by its own gravity penetrating the pulpal spaces. The teeth are kept standing upright in a moist medium, then decalcified, and rendered transparent by carbolic acid, thus giving ideal pictures of the distribution of the branches of a pulp.—H. MORAL, *Deutsche Monatsschrift für Zahnheilkunde*, per *Zahnärztliche Rundschau.*

Sawing Thin Sheet Metal.—To saw thin sheet metal "sweetly" with a hack saw the metal is clamped firmly between boards and both are sawed through. A special saw with fine teeth is best for this purpose; it is not essential, however, if the metal is clamped between substantial boards.—*Dental Brief.*

Aluminum Paint as an Adjunct in the Dental Laboratory.—Aluminum paint is a most useful adjunct, since with it an old vulcanizer, gas ring, or kerosene heater may be made to look like new. It is easily and quickly applied, and will stand heat well.—G. H. Fetherston, *Australian Journ. of Dentistry.*

Sterilizing Fluid for Small Instruments.—A very good sterilizing fluid for small instruments can be prepared by adding to a 10 per cent. solution of formaldehyd as much borax as will dissolve. The borax prevents any action of the formaldehyd on the instruments themselves, while not interfering with its sterilizing efficacy.—*Edwards' Dental Quarterly.*

Cleaning the Cervices of Teeth Before Applying the Rubber Dam.—The rubber dam should never be applied to a tooth before its cervix has been cleaned and disinfected. If this precaution is omitted, infectious material is forced by the rubber and the ligatures under the gum margin, where it may remain for hours. The interruption in the circulation of the blood favors infection of the weakened tissue. For disinfection, hydrogen dioxid followed by thymol-alcohol is recommended.—H. Pichler, *Oesterreichische Zeitschrift für Stomatologie.*

A Quick Method of Making Impression Trays for Difficult Cases by Means of a Vulcanite Press.—The method suggested for obtaining an accurate impression, if isolated or elongated teeth remain in the mouth, is as follows: An impression is taken in modeling compound; around the teeth the compound is scraped off to a depth of 2 mm., and a cast is poured with low-fusing metal of lead 5, tin 4, bismuth 9 parts. A sheet of soft metal is roughly swaged to the cast, which is then invested in a flask and pressed once or twice in the vulcanite press.—Dr. Barra, *Deutsche Monatsschrift für Zahnheilkunde.*

Protecting a Lancet Blade.—It has been recommended for a long time to protect that part of a lancet blade not needed in lancing the gums, in adults and especially in children, by wrapping it with gauze, leaving only the end of the blade exposed. Any sudden movement of the patient would not then endanger the soft parts. Protecting gauze thus applied, however, is difficult to keep in place, and unless tied with thread may loosen and be a source of annoyance. A much better plan is to cut a Johnson cotton roll slightly shorter than the blade and press the blade through the center of it, exposing only what is required at the end. The roll holds tightly on the blade, and can be safely pressed against the lips or cheeks to hold them away while the point reaches the desired spot.—*Dominion Dental Journal.*

The Water Syringe as a Tongue Depressor, Cheek Retractor, and Light-Reflector.—In grinding roots or teeth in preparation for crown and bridge work, water is most important. With an office assistant, this problem is only partly solved. Most practitioners are without an office assistant, and find it difficult in most cases, especially in posterior teeth, to feed water to the stone, to retract the patient's cheek, or depress the tongue and reflect light at the same time. The stem of a water or air syringe is cut down to a length of 1½ inches, and to it is riveted a piece of aluminum plate slightly bent. With this, the cheek can be retracted so as to protect it from burns or lacerations, and the tongue depressed for grinding the lingual surfaces of teeth. If the aluminum shield is kept polished, it will reflect light very brightly.—F. F. Schwartz, *Dental Review.*

The Teeth and Life Insurance.—That dental and oral conditions have an influence on the health of individuals is being recognized by life insurance companies. In 1914, one of the large companies, the Metropolitan, issued a pamphlet—"Teeth, Tonsils and Adenoids"—in which is stated that it is "Printed and distributed by the Metropolitan Life Insurance Co. for the use of its policyholders." The issuing of a pamphlet of this character is commendable and shows a progressive spirit on the part of this insurance company. While some portions of the text would have been more exact had it been written by a dentist, it is an acceptable publication as it is, and will undoubtedly prove of value as an educational medium along these lines.

People are awakening to the fact that diseased conditions of the teeth and mouth are more detrimental to health than they formerly supposed, and one of these days general dental and oral conditions will be taken into account when examining applicants for life insurance.—*Dental Summary.*

Contra-indications to the Use of the Rubber Dam in Amalgam Filling Operations.—The use of the rubber dam in amalgam operations is rarely indicated, provided the cotton rolls and saliva ejector are intelligently used, and all things arranged for a careful but expeditious operation. Washing the cavity and margins with warm alcohol precludes contamination from the saliva, and thoroughly dries the field of operation. Many good cavity preparations extending beneath the gum would be extremely difficult cases for the use of the rubber dam, and a rubber clamp would interfere with the use of a matrix. One of the principal indications against the use of the rubber dam is the necessity of *immediate* closure of the jaw for the purpose of noting the occlusion, and particularly the movements of the mandible. This must be done at once, and before the filling material begins to crystallize, at which time there is great danger of crushing and breaking down a carefully contoured filling. This danger is *nil* before the filling has commenced to set. The saliva does no damage to the filling material after it is in place.—W. R. Pond, *Items of Interest.*

Collecting Blood for the Wassermann Test of Syphilis.—In view of the fact that whole volumes have been devoted to the Wassermann reaction, any attempt to describe it briefly would be useless, particularly as the actual performance of the test consumes too much time to bring it within the province of the busy practitioner. It consists in the detection in the patient's blood of certain substances produced by the action of the syphilitic virus. It is of more practical importance to the dentist to know how to collect the blood for the test, and the interpretation of the results obtained. To obtain the blood, the patient's middle finger is first wiped off with alcohol, and the pulp of the distal end of the finger toward the ulnar side is given a deep puncture with a sharp-pointed lancet. This as a rule causes little or no inconvenience. About two cubic centimeters of blood should be collected in a small sterile test tube, and can usually be obtained in a minute or two by having the patient's arm hanging down and squeezing the finger after the manner of milking a cow. When the blood is obtained, the tube should be sealed with a cork, not with cotton, and put in a cool place, preferably on ice, until the test is made. Ordinarily the blood will keep in good condition for three or four days.—R. H. Ivy, *Dental Review.*

The Quality and Quantity of Gold to be Used in Casting Gold Inlays.—The inlay should be cast of 24-karat gold for ordinary cases. Whenever the stress of occlusion demands a metal of greater strength, or attrition requires a metal with the property of hardness in a degree not possessed by pure gold, then five or ten per cent. of platinum should be alloyed with it.

The quantity of gold employed should be greatly in excess of the amount actually required, about five times as much in small cases, and at least twice the required amount in large cases. A mixture of nitrous oxid and illuminating gas used in the nitrous oxid blowpipe furnishes the most suitable means of properly melting the gold for casting. The metal should be heated until white-hot and immediately cast while it is in this extremely fluid condition.

The shrinkage of gold or the management of its shrinkage as commonly understood and applied to inlay work is not of so much importance as is the management of the property of spheroiding. This property is possessed by metals in the fluid state, as is evinced by the molten gold, which refuses to run into the mold. However, as soon as pressure is applied this property is overcome, and it is forced into the mold and so held; but on congealing, this pressure is automatically cut off and its property of spheroiding again manifests itself in its power to control the direction of the shrinkage.—A. J. Bush, *Dental Summary.*

Hints, Queries, and Comments.

FINISHING VULCANITE PLATES.

Vulcanite plates can be finished beautifully with pieces of glass in the manner customary with shoemakers. This simple method seems to be superior to the use of scrapers.

Jacob Julian Fischman.

Brooklyn, N. Y.

COLORING PLASTER IMPRESSIONS.

A few grains of carmine powder placed into the water which is used for mixing the plaster will impart to the impression a pleasing color and one which is of service in separating the plaster cast from the impression.

Wright B. Lee, D.D.S.

Eugene, Ore.

REPAIRING A BELLOWS DISK.

Often a bellows disk will break during an important soldering operation in such a way that the rent is beyond repair. In case of such accident, the piece to be soldered is kept hot over a Turner burner. At a garage, a piece of inner tube 24″ × 4″ is obtained, split lengthwise, and cut in halves so as to make two pieces, and a bevel of about 1″ is shaved or pared on one side of each piece. Rubber cement is then applied to both surfaces and allowed to dry for a couple of minutes. The surfaces are then put together and the resulting sheet of rubber is laid between two boards, placed in a vise, tightened, and left for five minutes. This emergency repair will prove valuable to the country dentist who lives miles away from a base of dental supplies or a dental repair shop.

Franklin S. Adams, D.D.S.

Waterville, Kans.

Obituary.

DR. LOUIS JACK.

Died, at his home, Moylan, Pa., December 9, 1914, in the eighty-second year of his age, Louis Jack, D.D.S.

Dr. Jack was born at Germantown, Philadelphia, March 26, 1832. His parents were Josiah and Elizabeth (Foster) Jack. His early education was obtained at the Bridgewater Academy, in Beaver county, Pa. When Louis was a young man eighteen years of age, his father went to California with the "forty-niners," leaving the family in the care of a guardian at their home in Beaver county. It was the father's desire that his son should join him in California, but he had developed an interest in the subject of dentistry, and after careful consideration he decided that he would remain in the East and take up the study of dentistry in Philadelphia.

He entered the office and laboratory of the late Dr. Wm. R. White, a brother of John DeHaven White, where he remained for a period of three months as a pupil, working interestedly in all of the procedures of the laboratory and observing as much as possible of operative work in Dr. White's office. At the end of three months he accepted a position as laboratory assistant to the late Dr. C. C. Williams of Philadelphia, with whom he remained in association until he entered the Philadelphia College of Dental Surgery

DR. LOUIS JACK.

in 1852, continuing the association throughout his college course until he graduated in 1854. During his period of studentship with Dr. Williams he read all available works upon the subject of dentistry.

At the old Philadelphia College of Dental Surgery he became intimately acquainted with Dr. Robert Arthur, then a teacher in that institution, an acquaintance that ripened into an association and friendship which continued until Dr. Arthur's death. During the winter of 1855–56 Dr. Jack had an office in Dr. Arthur's house, and by reason of his close relation with Dr. Arthur became thoroughly acquainted with his methods of work and with the character of his operations, concerning the high quality and excellence of which Dr. Jack has borne public testimony. When Dr. Arthur left Philadelphia to take up his work in Baltimore many of Dr. Arthur's former patients came under his care, and in 1904 Dr. Jack publicly stated that much of the work done by Dr. Arthur nearly fifty years ago, for those patients who had fallen under Dr. Jack's observation, was in perfect condition, much of the work having been done with cohesive gold.

Dr. Jack was, by reason of his association with Dr. Arthur, immediately concerned with the former's discovery of the practical utility of the cohesive property of pure gold foil. It had previously been known that certain makes of gold foil for dental use possessed an adhesive or sticky quality, but that quality was until its practical usefulness was demonstrated by Dr. Arthur, generally considered to be a defect—which, as a matter of fact, it was, with respect to the older methods of manipulation concerned in the production of so-called "soft gold" fillings. During the winter of 1855, however, Dr. Arthur requested Dr. Jack to make tests of the comparative density of crystal ("sponge") gold and ordinary foil. He furnished Dr. Jack with a book of foil which had for many months been left uncared-for in his cabinet. Dr. Jack on commencing to use it found that it was harsh and hard in its working quality. Dr. Arthur suggested annealing to soften it, and immediately observed with surprise the fact that it would adhere particle to particle like crystal gold. After watching the progress of the test filling made by Dr. Jack he went to his office and proceeded to make practical use of this newly discovered "adhesive" property. From that date he ceased to use any other kind of gold.

Dr. Jack has made several contributions to dental literature dealing with the use of cohesive, or as it was then called, "adhesive" gold foil, and has also definitely fixed the credit for the practical utilization thereof on an historical basis; but while Dr. Jack modestly accords to Dr. Arthur the whole credit for the discovery, the data would strongly indicate that Dr. Arthur and Dr. Jack were jointly the discoverers of the utility of this useful characteristic of our most important filling material.

While Dr. Jack was always intensely interested in everything, both scientific and practical, pertaining to the development of dentistry as a profession, he was pre-eminently the dental practitioner. He had been closely related to a relatively small group of eminent men in dentistry who achieved distinction as teachers and investigators, and whose activities were more particularly concerned with the increase and dissemination of the data upon which professional dentistry has its foundation, in all of which Dr. Jack maintained an intense and sincere interest throughout his long professional career. It was his contact with these developmental activities that quickly led him to appreciate the very great importance of dentistry in its health relations, and shaped his professional ideals upon a most exalted plane.

He entered upon the practice of dentistry at a time when it had not appreciably freed itself from the handicap of a spirit of commercialism which permeated in greater or less degree the whole professional fabric. He at once put into effective practice the principles of professionalism which were representative of his own attitude of mind toward his life-work. He was among the very first to realize that his remuneration must be based upon service and not upon the sale of things necessarily incident to that service. He consistently carried out a system of fees for service when the majority of his colleagues were charging a price for fillings and for artificial dentures based upon kind or amount of material involved in their making. Through his success in demonstrating the application

of those higher ideals to practice he became a center of professional influence which encouraged others to follow his example, for which reason it may be truthfully said of him that he did more than any other one man in his locality to raise the standards of dental practice and place it upon a professional basis.

He gave much attention to the improvement of the dental armamentarium. He was probably the first to use the matrix as an adjunct in contour filling operations. His matrices, matrix pluggers and accessories are the embodiment of the first attempt to utilize the matrix in filling operations. When the electro-magnetic mallet of Bonwill was first produced, Dr. Jack was among the first to use it, experimenting largely and with a considerable degree of success in the direction of its improvement.

He was interested in the development of the *International Dental Journal*, and was for a time president of the corporation which owned and published it. He was a member of the National Dental Association, the American Academy of Dental Science, the Odontographic Society of Pennsylvania, the Odontological Society of Pennsylvania, the Pennsylvania State Dental Society, the Academy of Stomatology, and the Philadelphia Dental Club.

Dr. Jack retired from active practice a number of years ago and devoted himself to the pleasures and comforts of a retired life, pre-eminent among which to him was the culture of roses, upon which subject he was a recognized authority.

He was the last survivor of the class of 1854 of the old Philadelphia College of Dental Surgery.

Simple-hearted, transparently honest, gentle, sympathetic, accessible and helpful to his younger colleagues, without egotism yet confident of the ultimate success of the principles for which he stood; successful in every phase of his professional work;—he was the embodiment not only of the best type of professional man, but of the citizen and Christian gentleman.

His death was due to physical complications of old age. His widow and six children survive him. His remains were incinerated and were buried in Germantown, Philadelphia, on December 12, 1914.

DR. G. BERTRAM F. MONK.

Killed in action, December 18, 1914, G. Bertram F. Monk, D.D.S., lieutenant in the Royal Warwickshire Regiment.

The son of Dr. Chas. J. Monk, late of Wiesbaden, Germany, now of 142 Harley st., London, W., Dr. G. Bertram Monk was born September 15, 1891. He was graduated at the Michigan University Dental College with the class of 1913.

At the outbreak of the war he was a member of the London Artists Rifles, and was studying at Guy's Hospital, London, for his English dental and medical degrees. Shortly afterward sent to the front, he was given a commission in November last in the Royal Warwickshire Regiment, which he had held for about five weeks, when he fell on the field of honor in France.

DR. ALEXANDER M. HOLMES.

Died, July 31, 1914, in Morrisville, N. Y., of old age, Alexander M. Holmes, D.D.S., in his eighty-eighth year.

One of the oldest and most prominent dental surgeons in the state of New York, and a distinguished citizen of Madison county, was removed in the demise of Dr. Alexander M. Holmes, who, on July 31, 1914, in his eighty-eighth year, died from infirmities incident to old age.

Although all his life was spent in a small community, Dr. Holmes attained unusual distinction within the ranks of his profession. In 1867 he was one of the charter members who drafted laws for the organization of the New York State Dental Society, in which body he was called to hold various offices, including that of president. His tenures of office, as state censor for the Sixth judicial district, as president of the Sixth District Dental Society, and as president of the Board of Dental Examiners, and his connection with the University of the State of New York and the State Board of Regents, all attest to the respect in which he was held in dental, social, and educational circles.

For many years the deceased had enjoyed a large and lucrative practice, spending his winter months in New York City in the practice of his profession. He kept even pace with the progress of dentistry, and contributed several valuable mechanical devices in its aid.

Dr. Holmes was born in Westford, Otsego county, and served as apprentice to Dr. Wiggins, a medical practitioner of McGrawville, and to Dr. Thompson of Cortland, Dr. Allen of Syracuse, and Dr. Dwinelle of Cazenovia, dental practitioners, receiving the degree of D.D.S. from the Baltimore Dental College in 1851. In 1849 he started dental practice in Morrisville, N. Y., where also he took a most active part in political and economic movements, and enjoyed such positions of honor and trust as that of county treasurer, delegate to the republican national convention at Philadelphia in 1872, member of the Madison county board of supervisors, representative of the town of Eaton in that body for thirty-two years, state senator, president of the First National Bank of Morrisville for forty years, and other high positions of distinction.

He was one of the promoters of the Madison County Home for Destitute Children at Peterboro, and for many years president of the board of trustees of that institution.

Interment was made at the Cedar Street cemetery.

Death of Dr. Chas. R. Butler.

We regret to have to record the death, suddenly, on December 15th, from neuralgia of the heart, of Dr. Chas. R. Butler of Cleveland, Ohio. An obituary notice of this distinguished practitioner will be published in the next issue of the Cosmos.

Society Notes and Announcements.

DENTAL FACULTIES ASSOCIATION OF AMERICAN UNIVERSITIES.

The Dental Faculties Association of American Universities will meet on February 24 and 25, 1915, in the Thomas W. Evans Museum and Dental Institute, at Fortieth and Spruce sts., Philadelphia, Pa.

Edward C. Kirk, *Sec'y.*

NATIONAL MOUTH HYGIENE ASSOCIATION.

A series of illustrated lectures on Mouth Hygiene has been prepared by this association for rental service. The first lecture of the series, a talk suitable for a mixed adult audience or school pupils above the age of twelve years (designated as lecture "A") is now ready. The lecture set (manuscript and 36 slides) will be furnished to members of state dental societies and others who may be considered competent to present the matter to the public, at a fee of One Dollar per use.

For further particulars and application blanks, address the Director of Extension Lectures,

Edwin M. Kent, D.M.D.,
222 Washington st., Brookline, Mass.

WASHINGTON UNIVERSITY DENTAL SCHOOL.

Alumni Association.

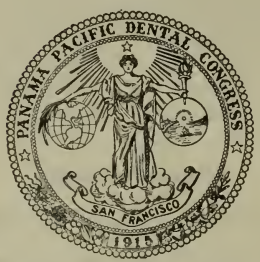
The forty-ninth annual clinic of the Alumni Association of the Washington University Dental School will be held on Monday and Tuesday, February 8 and 9, 1915, in St. Louis, Mo. Papers of interest to the progressive dentist will be read. The Executive Committee is making every effort to have this meeting one where the practical as well as scientific side of modern dentistry shall be shown. Mark off the date—come—get new inspiration. All ethical dentists cordially invited.

H. M. Fischer, *Sec'y,*
St. Louis, Mo.

Panama-Pacific Dental Congress.

San Francisco, Cal., August 30 to September 9, 1915.

THE following explanation of the meaning of the seal is given by Dr. Herbert J. Samuels, of Oakland, Cal., its designer: The female figure, representing Minerva, the Roman goddess of wisdom, and more especially the knowledge of the arts and sciences, scientific and practical truth, surmounts the universe, and standing on a bank of clouds, offers on one hand the light of learning, typified by the torch, and on the other the reward of achievement and honor, symbolized by the laurel. The two spheres represent the name of the congress and the place of meeting. On the right of the figure is the Western hemisphere with the two oceans which have been made one by the Panama Canal, and on the left is the "Golden Gate," the Bay of San Francisco, and the wonderful city on its shores. The fruits and flowers furnish a pleasing setting for the year, "1915," and signify that the country in which the congress will be held abounds in fruitful opportunities and blessings.



OPENS AUG. 30TH, 1915

THE SEAL.

THE Panama-Pacific Dental Congress is fortunate in having secured space for its meeting in the new Auditorium in San Francisco, as it is one of the finest auditoriums in the world. It covers an entire city block, and contains every modern convenience for the use of societies and conventions. Its main hall will seat 12,000 persons; 6000 in the balcony and 6000 on the floor. The latter space will be occupied by the exhibits of dental and pharmaceutical goods, and some of the general sessions of the Congress will be held in the balcony, the exhibit hall being closed to visitors during these sessions.

Besides this main hall, the Auditorium contains six halls with a seating capacity of about 1200 each, and four with a seating capacity of about 500 each. Enough of this space will be at the disposal of the Congress to accommodate the Oral Hygiene and other educational exhibits, the clinics and meetings of the various sections, and space will also be provided for the special meetings of the societies which will meet here as a part of the Dental Congress.

The Auditorium is located in the center of San Francisco, within eight blocks of all the leading hotels, and may be reached from the Exposition grounds in about ten minutes by either one of two direct car lines.

No Dental Congress ever held has had such good accommodations, and the fact must not be overlooked that all its sessions, clinics, and exhibits will be held in one great building, easily accessible from everywhere.

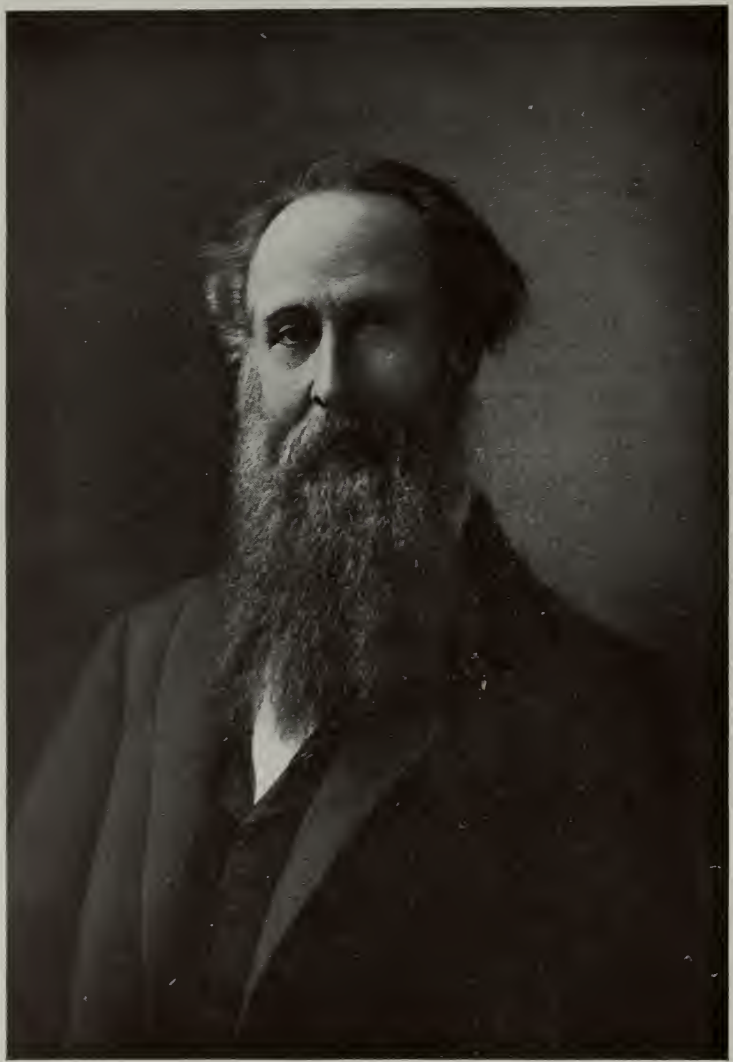
Hotel Reservations.

There are 1328 hotels and rooming-houses, which with 600 apartment houses represents a total of over 90,000 rooms, with accommodations for over 200,000 guests at any one time. Just finished are over 150 hotels and apartment houses giving nearly 15,000 rooms more, in addition to thousands of flats and rooms obtainable in private residences.

The San Francisco Hotel Bureau, representing more than 350 hotels, etc., will make contracts for hotel and other accommodations, and guarantees all its contracts. A San Francisco bank is its depository. These accommodations will be at rates of from $1.00 to $3.00 a day, per person, European plan, and from $3.50 and up per person, a day, American plan, for any date and any length of time desired. No charges of any kind, but a satisfactory guarantee must be given that the rooms will be used at the time stated.

The Bureau has the indorsement of and is operated in conjunction with the Panama-Pacific International Exposition, etc.

Applications for reservations should be directed to KIRK HARRIS, Manager San Francisco Hotel Bureau, Kearny and Market sts., San Francisco.



Charles R. Butler

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

TECHNIQUE FOR SOME OF THE PROBLEMS IN CASTING.

By T. P. HINMAN, D.D.S., Atlanta, Ga.,
PROFESSOR OF OPERATIVE DENTISTRY AND ORAL SURGERY, ATLANTA DENTAL COLLEGE.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Philadelphia, June 30, 1914.)

BEFORE casting was announced, a great many of the steps that are now used in crown and bridge construction were very tedious and difficult in their technique, and some of them almost impossible.

When casting was first announced, it was difficult for me to become enthusiastic over this process, as I had for many years been constructing inlays and bridge attachments by other methods, with most satisfactory results. Gradually, when great possibilities seemed apparent and I became more familiar with the technique, the results obtained seemed to justify this process. Now, after a period of eight years' experience with casting, and when some of my supposed successes have returned in the shape of failures, I think it time to pause for awhile and take an inventory to find the cause of such failures.

Looking backward over the field of inlay work and some of the results obtained by skilful operators, we must admit that some of the older processes show better results than are now being obtained in casting. The permanence of some of the old burnished or swaged work which has stood the test of time should be to the observant dentist food for thought.

Difficulty in obtaining accuracy by the indirect method. On account of the difficulties encountered when we attempt to cast some of the more intricate inlays and bridge attachments—and I find when they are finished they rarely go to place—we might consider some of the older methods to see if, in part, they could be applied to our modern casting system. The use of the indirect or amalgam model method solved some of the difficulties, but still, when an attempt was made to cast the large mesio-occluso-distal inlays, following the most careful technique in impression, model, wax matrix, investment, and casting, my results were far from accurate. A great many things may enter into this

failure, due to changes in the investing material during setting and the tendency of gold to shrink toward a common center, etc. It is true that when we cast a large mesio-occluso-distal inlay by the indirect method, we are able by swaging, grinding, and burnishing to secure an appropriate fit. On account of the fact, however, that such large inlays should not be cast of pure gold, owing to the inherent weakness of this material, it has been found that large restorations should be cast of an alloy. This increases the difficulty in making them fit the amalgam model accurately.

Pure gold margins. It is so essential to my mind that the margins at least of all gold inlays should be made of pure

Fig. 1. Fig. 2. Fig. 3.

gold, so that they may be burnished after the inlay has been set and before the cement has hardened, that I have adopted the old method of swaging or burnishing 3/1000 pure gold on the model, trimming this matrix to overlap the cavity margins about 1/32 of an inch. Inlay wax is melted or pressed on the gold matrix while it is in place on the amalgam model; this wax is then carved to correct form and the whole construction invested and cast with an alloy. I prefer, as a rule, a three per cent. platinum-gold alloy for this work. (See Figs. 1, 2, 3.)

Platinum-gold alloy for body of inlay. Inlays cast by this method have the advantage of great resistance, maintaining their form during masticatory stress, at the same time retaining the advantage of the pure gold margin found so desirable for burnishing purposes. Another decided advantage is gained, because the matrix into which the alloy is cast seems to prevent, to a considerable degree, the shrinkage that is so apparent in the ordinary casting. It also leaves a perfectly smooth surface next to the tooth, free of nodules and maintaining its original form—for when gold is cast in the ordinary investment, enough of this investment is brushed away by the molten gold flowing over it to prevent the inlay from going to place, in fact making an inlay larger on the inside than the original matrix. This is especially true when a sharp angle is left at the occlusal step, or a narrow neck is made in the occlusal anchorage.

I will not consider at this time the futility of casting, directly or indirectly, against porcelain, but will simply advise strongly against any such foolhardy procedure.

The advent of interchangeable facings has been a great step forward in bridge construction, as it allows us to cast against these backings from which the porcelain has been previously removed, and to obtain results superior to any of the older methods of anatomical construction.

PORCELAIN CROWNS WITH BAND AND POST, AND CAST BACKING.

Let us consider for a moment the construction of the band-and-pin crown. Everyone has noted that when an incisor root is prepared for a band, and the band is made to fit closely as it should be, and a cap soldered on it and trimmed flush with the band, the resultant cap is so small that the porcelain facing will either overlap the cap, or, if ground to fit the circumference of the cap, the result will be a constriction of the porcelain at the neck, which is very unsightly. We can easily obviate this by changing our construction to the following method:

A band is made of 30-gage platinum which is closely adapted to the root, being soldered with 5 per cent. platinum solder (see Fig. 4); after trimming to correct length, a cap is soldered on this band of the same metal. Instead of trimming the cap flush with the band,

it is left overhanging about 1/32 of an inch. The triangle left on the outside of the band and cap is then filled with pure gold by melting. (See Fig. 5.) The resultant construction gives us a correct reproduction of the root-end. (See Fig. 6.) It will be found that the porcelain facing can be ground to fit this cap and band accurately without grinding its mesial or distal surface. An interchangeable facing and backing are then adapted to this construction, and inlay wax is melted on the lingual surface. This wax should be carved to correct contour, being sure to restore the gin-

Fig. 4. Fig. 5. Fig. 6.

gival convexity or cingulum. The facing is removed, and the cap, pin, and backing are invested and cast. By this method we are able to obtain a more perfect crown anatomically than by any other method of which I have knowledge.

Causes for recession of gums around bands. I might add, in passing, that if the labial convexity and the lingual concavo-convexity are restored in crowns of this character, the tendency of the gums to recede around the band will be corrected to a very considerable degree, as I am firmly convinced that one of the chief causes of recession around banded crowns comes from want of proper contour, for if the labial surface is left flat and the lingual surface made only concave, the food, during mastication, is driven against the gingival border of the gums, tearing them away from their attachments, thereby causing the recession so frequently seen around banded crowns.

This same method is applied to bicuspids. I might add that the iridio-platinum pin which is used in this construction should always be allowed to extend well through the cap, so as to engage the cast metal.

To those who have become expert in casting, it is possible to flow inlay wax around the triangle left by the overhanging cap, and cast this part of the appliance at the same time when the backing is cast, instead of flowing the pure gold on the platinum band, as has been previously stated.

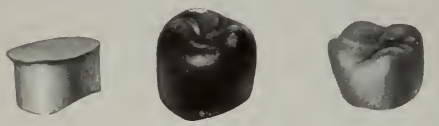
CAST GOLD CROWNS.

In the construction of all-metal crowns, I have found the following technique to give admirable results:

After the proper root preparation has been made, a band is constructed of 30-gage platinum and soldered with 5 per cent. platinum solder. This band should be made slightly convergent toward the occlusal surface. After careful adaptation, it is trimmed flush with the occlusal surface of the root, and a flat cap of the same material is soldered to it. This cap should be trimmed flush with the band. (See Fig. 7.) A wax bite is taken, and the cap and band are removed in the plaster impression. A model is run and placed in a small articulator, and the model and bite are given one coat of shellac, which has a tendency to harden their surfaces. Inlay wax is then melted and flowed to completely cover the cap and band. While the wax is soft, the impression is made in the occlusal surface of the opposite tooth. The inlay wax is carefully carved so as to restore a proper amount of lingual and buccal curvature. (See Fig 8.) The cap covered with wax is removed from the model and the mesial and distal surfaces covered with wax, this wax being carved to give the right amount of approximal contour. It may be replaced on the model to see if these are correct. All of the plaster is then removed from the inside of the band.

and the whole construction invested and cast in the usual way, thus producing a seamless, platinum-lined gold crown, which, if correctly carved, gives us a

Fig. 7. Fig. 8. Fig. 9.



more perfect reproduction of the natural tooth than any other means of which I have knowledge. (See Fig. 9.)

The wax is not allowed to go over the platinum that fits below the gum margin; about 1/64 of an inch of platinum is left exposed so that, when the crown is set, a burnisher may be run over the exposed platinum, and thus secure a perfect adaptation to the root surface.

In bicuspids, where the pulp is vital, this construction may be modified by cutting out the buccal surface of the band and soldering a piece of 36-gage

Fig. 10.

platinum over this surface. When the wax is applied to the metal band, the buccal surface is left uncovered, the result allowing for the replacement of the buccal surface with low-fusing porcelain. As it is exceedingly difficult to bake porcelain satisfactorily to a close adaptation and attachment to the buccal sides of these crowns, I have in some instances filled this buccal surface with synthetic cement, with apparently good results. Enough gold should be left on the occlusal surface to protect the porcelain replacement. (See Fig. 10.)

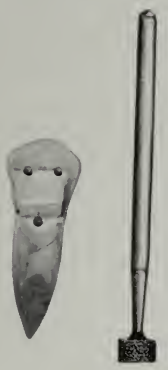
CAST HOOD ATTACHMENTS.

For many years I have been constructing attachments for vital incisors, canines, and bicuspids in such a manner as to prevent the showing of gold, and yet securing an attachment sufficiently firm to support a bridge of ordinary dimensions. After many futile attempts, for a while I abandoned casting as a method of producing these attachments, but since I have modified my technique, I have been able to cast them instead of using solder. The hood about to be described is used on canines and incisors, and is known as the three-pin two-step hood:

We will use for illustration a canine as an abutment, aiming to replace a lateral incisor. The preparation of the tooth is accomplished by cutting a step in the lingual surface of the canine about 1/16 of an inch above the gum line; another step is cut in the same surface along the line of approximal contact mesio-distally. These should be well defined and extend to the dentin sufficiently to give resistance to the finished hood. To do this, we use a No. 528 Miller carborundum stone. (See Fig. 11.) The mesio-lingual surface is then removed with the same stone, carrying the cut gingivally in line with the lingual step. This removal is necessary to prevent re-decay and give a firm attachment for the soldering. If the occlusion is very close, a portion of the lingual enamel is also removed. With a No. 3 bur, a hole is drilled in the lingual step about 1/16 of an inch deep, in line with the long axis of the tooth. Two holes are then drilled in the occlusal step in the same manner and to the same depth. These last holes should straddle the pulp. Sometimes it will be found necessary, instead of putting two holes in the occlusal step, to put one in the disto-occlusal and the other in the mesio-gingival step. The placing of these holes must be done according to the case in hand. All three holes should be

drilled consecutively without removing the drill from the mouth. (See Fig. 11.)

Fig. 11.



Pure gold 3/1000 is then adapted to the lingual and mesial surfaces, allowing a considerable overlap. An automatic mallet with a piece of orange-wood, trimmed wedge-shape with a flat end, used for a plugger will be found useful in malleting this gold on the steps; however, this may be accomplished by the

Fig. 12.

use of flat burnishers. While this backing is held in place, small holes are punched in it to correspond with the holes in the tooth. In these holes we place pins made of 20 gage iridio-platinum wire; the appliance is then removed with modeling compound which has been dry-heated. This, of course, must bring away the pins as well as the backing. The modeling compound is invested and removed, and the pins are attached to the backing with a very small quantity of 22-karat solder. (See Fig. 12.) The appliance is then returned to the mouth, reburnished, and trimmed to a slight marginal overlap.

The advantage of returning the backing and pins after soldering is that we get a re-alinement of the pins to the holes. The appliance is then removed in an impression. This may be done with modeling compound. After a model has been made, inlay wax is flowed over the backing and pins, and carved to correct contour so as to make an anatomical lingual restoration. The appliance is then removed from the model and all of the plaster cleaned away. It is then invested and cast with a gold alloy. The resultant hood gives a strong attachment, and if properly

Fig. 13. Fig. 14.

constructed, does not interfere with the vitality of the tooth. (See Figs. 13 and 14.)

Bridges have been placed in the mouth, the four incisors being restored by placing hoods on each canine. Two centrals have been restored by placing hoods on both laterals. I might add that the dummies used by me are made exclusively individual saddle, so that the speech of the patient is restored as well as the lost teeth. This hood has also been used as the anterior attachment for a bridge carrying both bicuspids, the distal attachment being preferably a gold crown. In some instances, however, I have made an inlay in the molar serve as the distal attachment. This, however, is not strongly advised, and must be used with discretion in favorable cases only.

Hoods for Bicuspids.

Where it is desirable to use a vital bicuspid as an attachment for a piece

of bridge work, the hood described in the following paragraph is found serviceable and satisfactory:

In the preparation of this tooth, the lingual cusp should be ground off completely, and enough of the occlusal surface removed to allow for sufficient restoration in gold to compensate for wear. Cavities are cut in the mesial and distal surfaces of the bicuspid, these cavities extending under the gum line. The lingual surface is then ground off so that there will be a gradual taper from the gum line to the occlusal surface. The occlusal enamel on the buccal side is gradually chamfered toward the buccal cusp: a proper tray is con-

Fig. 15. Fig. 16. Fig. 17.

structed of German silver, and the impression of this tooth is taken in Perfection modeling compound. From this impression is made an amalgam model. (See Fig. 15.) On this amalgam model is burnished 3/1000 pure gold; in some instances I use 1/1000 platinum. The matrix is trimmed to a slightly marginal overlap. On this matrix is melted or pressed inlay wax which is carved to an approximate occlusion, restoring the mesial, distal, and lingual surfaces of the tooth. (See Fig. 16.) This gold matrix and wax model may then be returned to the mouth for the purpose of correcting the occlusion, being careful not to allow the patient to bite into this hardened wax. After carving the wax away, or replacing it where it is too scant, this hood should be removed and cast with an alloy. This gives us a hood that has all the strength of a gold crown without its unsightly appearance. (See Fig. 17.)

Hoods of this description have been used by me for many years. I have inserted one such appliance in a patient's mouth, a bridge extending from the third molar to the first bicuspid, the anterior attachment being a hood of this description. It has been in the mouth for about ten years, but of course was made with solder instead of by casting.

GOSLEE TEETH.

In the construction of bridge work for the distal teeth, I have found the Goslee tooth a most excellent substitute. The technique of casting on receptacles to hold these teeth I wish to describe:

I have endeavored to cast a satisfactory receptacle directly from a wax impression, but my results have been very unsatisfactory. In a majority of instances, where these teeth are used, it is necessary to grind them in making the adjustment and occlusion, thus increasing the difficulty in casting the receptacle. If 1/1000 platinum or 3/1000 pure gold is swaged or burnished over the portion of the tooth intended to be used for attachment, and an iridio-platinum pin, 14 gage, thrust through the backing into the hole in the tooth, this pin being always soldered to the backing, it will be found that when the wax is flowed over the metal backing, and it is carved to proper contour and cast, the tooth will go to place more readily and without the necessary grinding and fitting that has to be done if no backing is used.

In this construction, it is very essential that the pin be soldered to the backing, for if this is not done, frequently investing material runs through the hole in the backing, surrounding the pin where it is attached to the wax, and thus prevents the cast gold from firmly attaching itself to the pin. The careful soldering of the pin to the backing of course prevents this, and we have a clean receptacle for the insertion of the porcelain tooth which allows it to go to place readily. It has become my practice to construct posterior work using the individual saddle in fixed bridge work. If care is used in this construction, I have found it much more

cleanly than the so-called self-cleansing bridge.

INLAYS AS BRIDGE ATTACHMENTS.

Inlays for bridge attachments have been used for many years by some operators. My experience has been that unless the inlay is well seated in the occlusal surface, and a small pin or pins placed in the gingival wall, they have invariably proved unsatisfactory. When it is desirable to use an inlay as a bridge attachment, the procedure is as follows:

After the cavity has been properly prepared, and the occlusal step and anchorage have been cut well into the crown, a hole is drilled, or in some instances, two holes are drilled in the gingival step; these should be about 1/16 of an inch deep and be made with a No. 3 bur. (See Fig. 18.) An impression is taken of the cavity in Perfection modeling compound, and a model made of amalgam. In this model is formed a matrix of 1/1000 pure gold in which are soldered pins of 20-gage iridio-platinum wire. It may then be returned to the mouth to correct the alinement of the pins. The matrix is then returned to the amalgam model, and inlay wax flowed over it and carved. This should then be cast of platinum alloy. The resultant inlay may be used as an attachment for bridge work with good results. (See Fig. 18.)

Fig. 18.

I do not, of course, cast every inlay into a gold or platinum matrix, but when an inlay involves more than two surfaces, it is my invariable custom to make my castings in this manner.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

ROOT-CANAL BROACH REMOVED FROM THE LUNG BY BRONCHOSCOPY.

By CHEVALIER JACKSON, M.D., Pittsburgh, Pa.

THE rarity of the loss of instruments from the skilful fingers of the modern dentist is evidenced by the fact that in the author's collection of nearly five hundred objects removed by bronchoscopy and esophagoscopy, the broach herein mentioned is the first dental instrument. One deciduous tooth that was aspirated after it escaped from the dental forceps, one molar that was aspirated into a bronchus after being knocked out by a fall, and three artificial dentures, constitute the only dental objects in the collection. Considering the fact that almost the entire population, at some time or other, passes through the dentist's hands, this is a wonderful tribute to dental skill. That accidents are possible, however, is shown by the following case:

A physician of thirty-nine years, while in the chair of a very skilful dentist, aspirated a root-canal broach which had slipped from the dentist's fingers during work on an upper molar. An excellent radiograph by Dr. Wm. O'Brien showed the broach in the right bronchus. Ten days later, the patient consulted Dr. H. W. Loeb of St. Louis, who referred the case to the author. Two radiographs (Figs. 1 and 2) made by Drs. Johnson and Grier showed that the

broach had worked its way downward, as small, long, pointed, metallic bodies always do, until it had reached the smallest, deepest bronchial branch it could enter. The author's positive films of the tracheo-bronchial tree when laid over the negatives showed the broach to be in a small posterior branch of a larger posterior branch of the right lower-lobe bronchus. The bronchoscope was passed under local anesthesia, and with the exact knowledge of the position

Fig. 1.

Fig. 1 is a radiograph showing a dental root-canal broach in a small posterior branch of a larger posterior branch of the inferior-lobe bronchus of a man of thirty-nine years. The foreign body is seen just above the dome of the diaphragm. It was removed bloodlessly through the mouth by bronchoscopy under local anesthesia.

of the foreign body it was promptly found and removed with bronchoscopic forceps. After removal, the patient sat on the observation stand and watched the next bronchoscopy. He left for his home in St. Louis the same evening. The time required for the operation was nine and one-half minutes for the application of the local anesthetic, and half a minute for the insertion of the bronchoscope and removal of the broach. It should be stated that bronchoscopic removal of foreign bodies from the bronchi is not always so quickly accomplished; but it is successful in over ninety-six per cent. of the cases, the bronchoscope being passed through the mouth and the foreign body thus removed bloodlessly through natural passages, with a mortality of but little over one per cent. in

Fig. 2.

Fig. 2 is a lateral radiograph taken of the same patient. The foreign body is seen to be in the part of the lung back of and below the level of the diaphragm, in this position of the patient and this stage of respiratory diaphragmatic excursion.

Fig. 3.

Fig. 3 shows the root-canal broach removed bloodlessly through the mouth by bronchoscopy, from a small broach of the right inferior-lobe bronchus.

uncomplicated cases. In children it is done without anesthesia, general or local.

Failures to remove, of which the author has had 5 in 482 cases, were all failures to find—not failures to remove when found.

A PROBLEM IN ANCHORAGE.

By LAWRENCE W. BAKER, D.M.D., Boston, Mass.

(Presented before the Eastern Association of the Graduates of the Angle School of Orthodontia, New York City, April 23, 1914.)

THIS morning I wish to present for your consideration a method of carrying the molar anchorage distally by converting the usual stationary molar anchorage into simple anchorage. This method consists in replacing the rigid buccal tubes by hinged or swivel tubes.

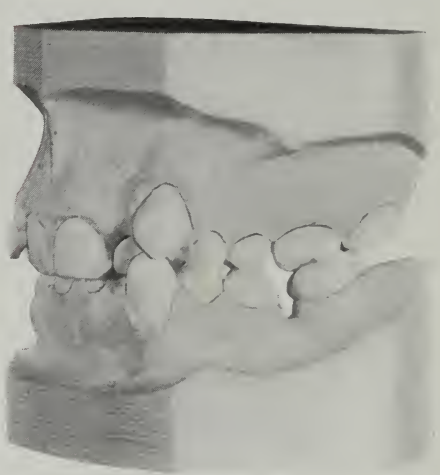
Every orthodontist present has undoubtedly met with two groups of cases in which it is necessary to gain space in the dental arches by moving the molar anchorage distally. The first group consists of cases in which room has to be gained for impacted premolars or canines. The second group is made up of mutilated cases where the remaining molars have migrated forward, and it is necessary to move one or both molar anchorages distally to gain space in order to supply the missing units of the dental arch.

All will agree that with the expansion arch and its usual form of anchorage (band and rigid buccal tube) this is a most difficult condition to bring about, for the molar anchorage is most apt to overbalance the resistance of the anterior teeth, and the space is gained at the expense of moving these anterior teeth forward instead of carrying the molar anchorage backward. The result of this mechanical disadvantage is that the osteoblasts are stimulated to activity in the wrong area, and the consequent bone growth takes place in the anterior region, and the facial lines are usually distorted according to the amount of space gained.

The case illustrated shows clearly one use of this swiveled tube and demonstrates its method of construction.

Fig. 1 shows a mutilated case of class 1. It will be observed that both the lower first permanent molars have been extracted, and that the second permanent molars have migrated forward and have partially filled the space of the missing units. In doing this these second molars have tipped forward, as

FIG. 1.



is usually the case when the first permanent molars, the foundation stones of the dental structure, are sacrificed. All modern orthodontists realize the importance of putting these second molars into their normal position and bridging the spaces of the sacrificed first permanent molars.

Realizing the difficulty of tipping and carrying back these anchor teeth with the stationary molar anchorage, it occured to me that, by substituting the

rigid buccal tube with a swivel tube, the problem would be simplified; so I proceeded to have constructed anchor bands for the lower arch with these swiveled tubes, the details of the construction of which are shown in Fig. 2.

Even with this simple anchorage and the expansion arch, I found after bringing the misplaced canines and incisors into line, that the resistance of these anterior teeth had weakened, and it was impossible to use them further for the purpose of carrying the molars backward, although this had been accomplished to a very appreciable degree. So without hesitation I employed the new Angle appliance principle, continuing, of course, with the swivel tubes. Fig. 3 clearly shows the appliance and the condition of the case at the time of employing it. It will be observed that, with this pin-and-tube principle, all the root resistance of these ten anterior teeth is utilized, and that the anchorage has been practically reversed; that is, these anterior dental units serve as stationary anchorage, while the molars with the swiveled tubes are the objects to be moved.

I have also used the same principle with the "new appliance" in several cases of impacted premolars and canines with the greatest satisfaction.

Fig. 2.

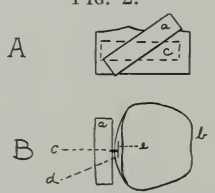
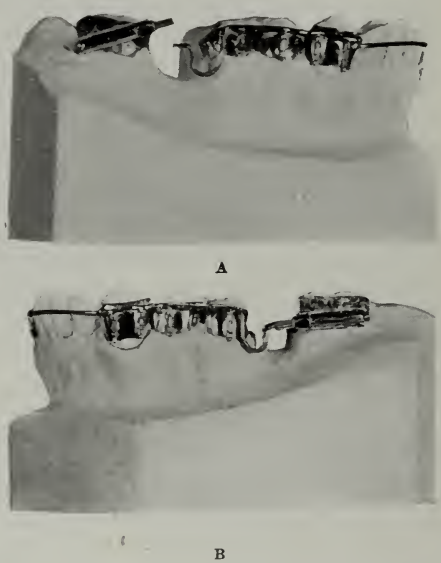


Diagram showing details of construction of swivel buccal tube. A, Side view of band and tube. *a* and *c* indicate swing of tube. B, Coronal view of A. *a*, tube; *b*, band; *c*, swivel pin, one end of which is "sweated" into a hole drilled in the wall of the tube; the other end passes through a hole drilled in the extension plate *d*, and soldered (22-k.) to washer *e*. Then each end of the extension plate is soldered (18-k.) to the anchor band.

I must add still one more important use for this swivel-tube principle, and that is in the treatment of excessive cases of infra-occlusion. It is our common experience, I believe, in treating these cases with the ordinary fixed molar anchorage to bring about a tipping of the molar anchorage; it matters little whether the case be treated with the expansion arch and rigid buccal tube or with the "new appliance" and rigid buccal tube, or with the Young lock; in each instance it is a mechanical impossibility to treat these excessive infra-occlusion cases without causing this aggravating tipping of the anchor molars. To those who have experienced this annoyance I strongly recommend this pivoted anchorage—for with it the prizing leverage on the anchorage is relieved, and the perpendicular elastics have perfect freedom of action.

I bring this method before you this morning as a contribution to the principle of anchorage in orthodontia.

Fig. 3.



A, Shows the freedom of motion of the pivoted tube. B, Shows tube swung down and the end-section of the arch connected to the mid-section, ready for the application of force.

TUBE TEETH AND PORCELAIN RODS: THEIR USES AND ADAPTATIONS IN PROSTHETIC DENTISTRY.

By JOHN GIRDWOOD, D.D.S.Univ.Pa., L.D.S.Edin., Edinburgh, Scotland.

(Continued from page 138.)

(XI.)

CHAPTER XIV.—Setting Crowns and Bridges.

The methods employed in attaching tube teeth, bridges, or gum tube sections to the various bases and anchorages which have been spoken of deserve more than the passing notice which they have received. With regard to the various media, those most frequently used are cement, gutta-percha, sulfur, amalgam, and vulcanite. In addition to these, screws and riveting may also be added as methods of attachment. Before proceeding to consider these, however, attention is directed to the fact that with tube crowns the attachment—generally a cap and post—can always be fixed on to the abutment before the crown is cemented to place, also in tube bridge work, the attachments being formed independently of the body of the bridge, can often be permanently fixed to the abutments before the body of the bridge is finally set. This has a more important bearing upon the choice of the cementing medium than at first appears, and favors the use of gutta-percha rather than cement in a larger number of cases than where most other forms of construction are employed. The materials and methods employed for the purpose will depend upon various factors, such as the nature and extent of the anchorage available, and the personal inclination or preference of the operator. The cementing media most commonly used are cement and gutta-percha, either singly or in combination. Cement has the advantage of affording the maximum amount of adhesion between the attachments and abutments, and so is of special value when a doubt exists with regard to the fixity obtainable by other means. It is, however, open to several objections, among which are its solubility, porosity, and difficulty of removal in case of accident or necessity. Its solubility may be lessened by attention to careful fitting, so that the junction between the root and the cap or crown is made as close as possible, as thereby the cement will obtain the maximum amount of protection. Its porosity permits it to become infected by putrefactive bacteria. This, however, can be prevented by the addition of about a tenth part by bulk of hydronaphthol to the cement powder, to which also may be added a drop of oil of cinnamon or cloves.

The advantages possessed by gutta-percha when skilfully used are the ease with which it can be removed, its insolubility, non-irritating properties, and tendency to reduce shock or stress on the abutments. The objection usually urged against it is the difficulty of manipulating it and the time thereby required to obtain the best results. The gutta-percha which is best suited for the purpose is the ordinary pink base-plate variety. The best results are usually obtained, however, by the use of a com-

bination of cement and gutta-percha employed in the following manner: The post being roughened by spurring it with a knife, in order to help the gutta-percha to adhere, post and gutta-percha should be heated, and a small quantity of the latter, barely sufficient for the purpose, molded along the post, when cap and post should be tried on to the root, forced carefully to place, and any surplus removed. It is important to avoid using too much gutta-percha, as this involves danger of spreading the band. The final cementing is to be carried out in the usual way, and the details of this process need not be entered into, as these are familiar to all. But the immediate after-effects demand more consideration than they usually receive, consequently the writer desires to draw attention to the use of hot water as a local anesthetic, after cementing the crown or bridge to place.

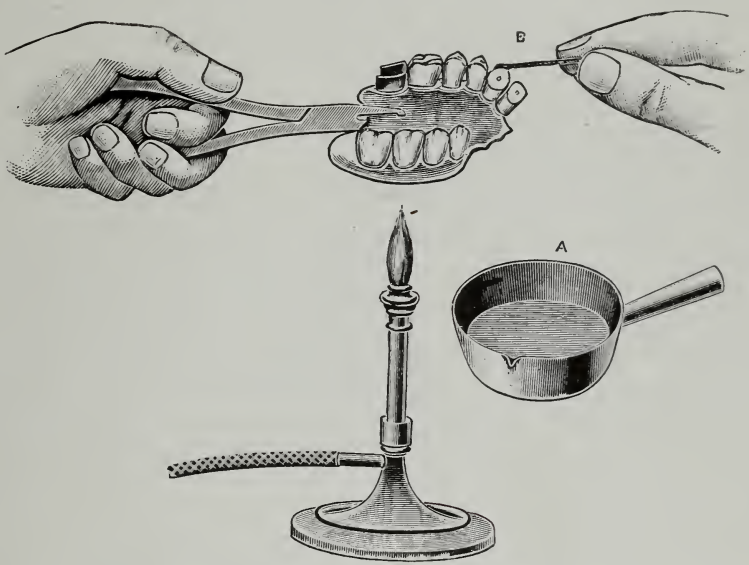
However carefully the method of cementing has been carried out, the bands fitted to the roots, and their depths proportioned to the case, the cementing-on process is always painful—slightly so, no doubt, in some cases, moderately so in most, while in others it is markedly painful. In these cases pain is doubtless due to a hyperesthetic condition of the periosteum and gum. From whatever cause it may arise, it is a form of pain which some patients are peculiarly intolerant of, and for that reason alone it is desirable to get rid of it as quickly as possible. It is surprising to find how ineffectual cocain is under these circumstances. Even a saturated solution, when applied between the gum margin and the neck of the tooth, seems to have little anesthetic effect. Of course a few drops injected will give complete anesthesia, but this is objectionable on several grounds, and is wholly unnecessary. The following plan will be found to give almost instant relief, and is unfailing in its action: Fill a fairly large syringe—say a 2-ounce one—with very hot water, as hot as can be borne without producing actual pain on the gum. The right degree of heat can be approximately judged by directing a stream on the finger before applying it. Before the cement has quite hardened, remove all pieces of lint, cotton, etc., from the mouth, and having the saliva ejector in place to remove the hot water as fast as it is applied, direct the stream of water forcibly on to the gum around the neck of the tooth, by holding the point of the syringe about two inches away from the neck of the tooth. By the time the syringe is half empty the pain will either have completely disappeared, or nearly so. All surplus cement should then be removed. Once more a *forcible* stream of hot water should be directed around the neck of the tooth and between the band and the gum, and if need be a third one, but this is rarely, if ever, called for. It is noted, therefore, that we have in water, used either hot or cold, as the circumstances of the case may demand, a simple, powerful, and easily controlled anesthetic agent (see Chap. V, July Cosmos, 1914, vol. lvi, p. 810) which is always at our command, and which is entirely free from the objectionable features which sometimes accompany the use of other anesthetics. Doubtless when the powerful anesthetic properties of hot water are fully realized, it will obtain wider recognition. When gutta-percha is used as the cementing medium, the same plan should be followed.

SETTING A BRIDGE WITH CEMENT AT ONE END AND GUTTA-PERCHA AT THE OTHER.

It is sometimes desirable to take advantage of the properties possessed by cement and gutta-percha in the above manner, and the cases in which a combination of these fulfils the desired results are fairly numerous. For example, the anchorage at one end may be ample, while at the other it may be deficient for the purpose of attachment by means of gutta-percha. In such a case the following plan will be found to yield entirely satisfactory results: The usual steps are carried out with regard to the preparation of the anchorage for cement and gutta-percha, and the latter is car-

ried to the point where final softening only is required before forcing the bridge to place. While an assistant mixes the cement, the operator should get ready the bridge for setting, and as it will have been heated throughout its whole length, the following plan should be adopted, whereby the end to be cemented is made cold, and will remain so long enough to permit the piece to be accurately forced to place, while the other end is not chilled too quickly. A stream

Fig. 175.



Shows mode of grasping plate in finally fixing teeth.

of ethyl-chlorid spray should be directed on to the end of the bridge which is to be cemented, and almost up to the middle. The cementing may then be carried out quickly in the usual way, before the cement has been affected by the heat or the gutta-percha by the cold.

The material and methods employed for attaching horizontal bars or posts into the tube of a crown or bridge afford considerable choice. As previously pointed out, the unglazed interior of the porcelain tube and roughened surface of the posts, along with a thin layer of cement, provide an enormously strong attachment—stronger, indeed, than is necessary. Generally speaking, the ends of a bridge or approximal surface of a crown are countersunk in order to permit of an inlay or inlays being formed on the posts or bars, and these provide against possible rotation, while adding greatly to the support of the porcelain and strength of the anchorage at the point where it is usually required. Unless there is a liability of the abutments spreading, the cementing medium need do little more than exclude moisture, consequently very soft gutta-percha, chloro-gutta-percha, or wax may be used, although of course cement is always to be relied upon; but no hard-and-fast rule can be laid down for all cases.

Amalgam, screws, split posts, riveting, and other devices may be employed with advantage in the manner ordinarily described in connection with their use, and the facilities afforded for doing so are probably greater in the case of tube work than in any other.

The use of vulcanite has been dealt with, and it only remains to deal with the use of sulfur.

As a cementing medium sulfur can

claim priority over the various forms of cement used at the present day, its use dating back to the eighteenth century. It is most commonly employed for fixing tube teeth to gold plates, and where it is possible to do so it is to be preferred to cement, for the reason that if circumstances arise which necessitate the removal of the teeth from the plate, this can be easily and quickly done by carefully heating the case to the melting-point of sulfur.

Sulfur can, of course, be employed in crown and bridge work also, but its special advantages are most apparent in plate work. The method of using it is as follows: The plate having been finished in the usual manner, a few shallow cuts are made in each pin with a file. The teeth having been cleaned and freed from all traces of oil—which can be done by boiling them for a few minutes in a strong solution of soda—the tubes should be dried by means of cotton wound around a broach, and, where platinum tube teeth are used, their interiors roughened by a clean tube file. The sulfur is melted in a small Berlin porcelain cup or an iron spoon until it is quite fluid. The plate should be grasped with pliers held in the left hand (Fig. 175), and plate and teeth heated carefully over a spirit or small Bunsen flame. This must be done gradually, and the flame ought not to be allowed to play on the porcelain. A wire spatula—a piece of flattened iron wire, pin-wire size—is dipped into the melted sulfur, and repeatedly conveyed to the heated plate and teeth. The sulfur runs by capillary attraction under the teeth and along the pins. When it has been ascertained that the sulfur has filled all the tubes and spaces, plate and teeth may be allowed to cool, and the excess of sulfur removed by means of a fine-pointed knife or point, after which the plate may receive the final polishing.

Various modifications in the manner of using sulfur are employed; for example, lump sulfur broken into small pieces may be placed on the end of each tube, and when plate and teeth are heated the sulfur will run through, additional pieces being used until a surplus shows.

Repeated melting of sulfur seems to improve its quality rather than to spoil it.

CHAPTER XV.—On the Use of Porcelain Enamels for Shading Artificial Teeth and Crowns.

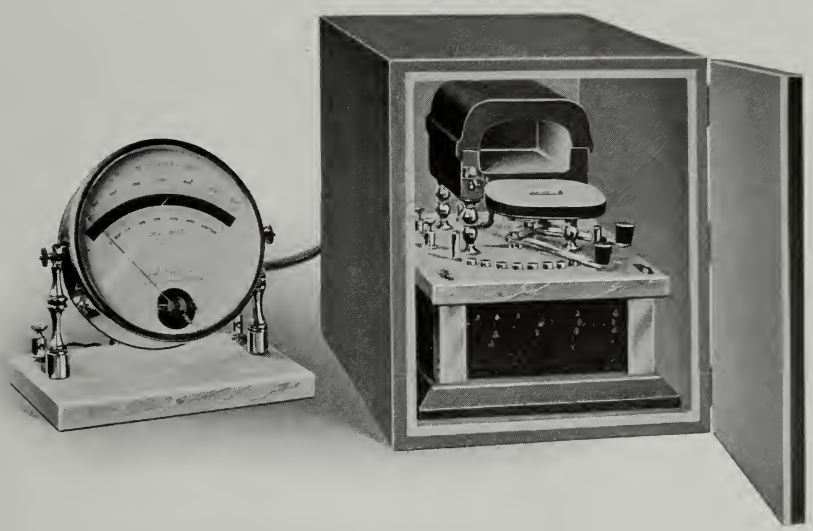
The introduction of porcelain enamels has made us much less dependent than formerly upon that wide selection of shades of teeth and crowns hitherto deemed indispensable, and the variations obtainable by their use cannot, in many cases, be got in any other way. It is unnecessary here to enter into a lengthy description of the use of these materials, as the instructions furnished by most of the well-known makers who supply them enable the least experienced to gain the end they have in view, with a little practice. The choice of high, medium, or low fusing enamels is, generally speaking, a matter of individual preference; at the same time care must be observed not to employ a very high-fusing enamel when poured teeth are used. The temperature at which the various enamels fuse to yield the best results are carefully set forth in the instructions which accompany them. It necessarily follows as the result of coloring teeth by the use of these enamels that the matter of cooling the porcelain becomes a question of importance, and while this has been already spoken of, its importance is such that no apology need be made for once more reverting to the subject, especially as most writers do not seem to have given this matter sufficient consideration. Doubtless this neglect has arisen from the fact that porcelain brought to a high temperature during soldering operations is protected by a mass of investment material, which, even when of moderate bulk, permits of the porcelain being cooled nearly uniformly throughout; whereas when porcelain is brought to a high temperature without the protective aid of investment material, such as the muffle of a furnace, a much longer time must be allowed for it to

cool down uniformly if the maximum amount of strength is to be obtained.

The period between 1840 and 1880 may be said to have marked the highest level of porcelain tooth manufacture, but even until 1890 the quality was generally excellent, although there were distinct evidences of falling off. One of the reasons given for this in a former chapter was "the stress of modern competition." Manufacturers will probably deny the truth of this, nevertheless it is true. Moreover, they have no cause to feel ashamed, as the fault lies with us as a profession, for the reason that we have followed the modern craze and sought cheapness rather than quality. Doubtless in many cases we have done so from lack of thought rather than from intention. The result, however, has been as stated. In fact, a comparison between the prices of the teeth manufactured about sixty years ago with those of the present day will go far to explain the difference in quality.*

No doubt, once the profession realizes that a high quality of porcelain is worth paying for, the manufacturers will endeavor to meet the demand; but they can only do so by following the lines of the old makers, who, in order to obtain the results which they achieved, never attempted a batch of more than a few hundred teeth at a time. These were fused at a sufficiently high temperature, and the muffle was allowed to cool slowly and evenly. This took from twenty-four hours to two or three days, the time depending upon the size of the furnace and muffle. Subsequent heating of such porcelain to a high temperature and allowing it to cool rapidly would not greatly impair its strength or toughness, but such treatment would greatly weaken present-day porcelain, particularly, as already explained, when the porcelain is not protected by investment. The treatment ordinarily considered sufficient nowadays is to allow even the smallest electric furnace to cool down without attempting to protect it from drafts or to retard the cooling in any other way.

FIG. 176.



Annealing box for electric furnace.

* Sixty years ago porcelain teeth were sold at 50 cents apiece; single gum tube teeth at 60 to 70 cents; two single gum tube teeth in one piece $1.75; three single gum tube teeth in one piece $2.00; four single gum tube teeth in one piece $2.50.

This may take from two to three hours, but is altogether insufficient. The plan which the writer has found to give best results is to stand the electric furnace in a box similar to that shown in Fig. 176. A box such as this might be made of wood or metal, but should be lined with asbestos slabs, about one-half inch thick, carefully jointed so as to make it practically airtight. After the porcelain has been fired, the door, which is also lined with asbestos in the same way, should be closed, and not opened for at least twelve hours. This will allow the porcelain to become sufficiently tempered or annealed, and so permit of its maximum strength being developed, although no treatment will make up for imperfect fusion of the porcelain in the first instance.

CHAPTER XVI. — Supplementary Suggestions.

It was the writer's intention to have concluded these papers in the last chapter, but on further consideration it appeared desirable to extend them still further in order to make them more comprehensive. At the same time the subject is far from being exhausted—and it is hoped that this may also be said for the reader's patience.

In addition to the materials mentioned in Chapter II, the following may be added:

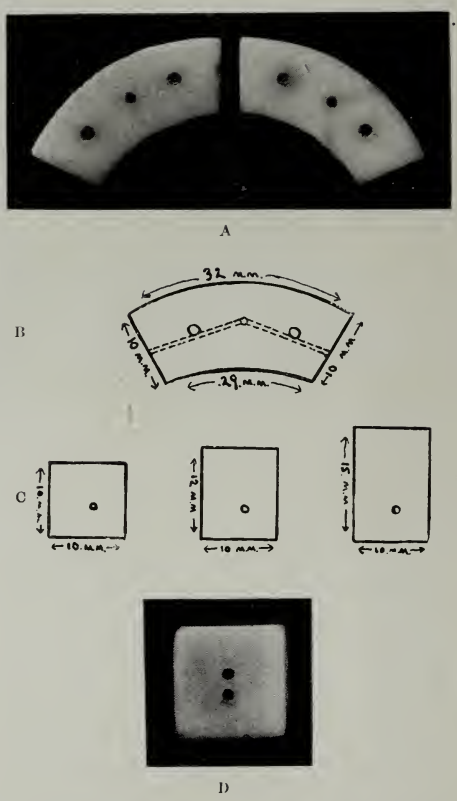
Description and Use of Curved Blocks.

Two sets of curved blocks, three in each set, known as Nos. 33, 34, 35, and Nos. 36, 37, 38; also rod, 15 mm. square on section, known as No. 39. (Fig. 178, D.) The set of three blocks Nos. 33, 34, and 35 are exactly similar in size and curve to the other set, Nos. 36, 37, and 38. The former, however, have only two vertical tubes through them (Fig. 177), each 12 mm. apart measured from their nearest points, while a detailed description of the latter set, Nos. 36, 37, and 38, is as follows: These blocks are each 32 mm. measured along the largest arc of the circle (Fig. 178), and are made in three sizes, 10 mm., 12 mm., and

Fig. 177.

Shows curved block.

Fig. 178.



A, Curved blocks Nos. 36 and 37. B, Sketch showing plan of blocks Nos. 36, 37, and 38, with vertical and horizontal tubes. C, Shows relation of horizontal tube to bottom edge of block. D, End view of rod No. 39.

15 mm. Each block has three vertical tubes through it, those at either end

being similar in size to those in the other porcelain rods and non-platinum tube teeth, while the central vertical tube has a caliber smaller than the others, about 15½ U. S. gage. The tubes at either end are 10 mm. apart, measured from their nearest points, while the center tube is situated exactly midway between these two. (Fig. 178, A.) In addition to the vertical tubes there are two tubes which extend horizontally through the blocks from either end, and

FIG. 179.

Case of edge-to-edge bite. The upper central, lateral, and canine of each side is formed from block No. 35. The lower incisors and canines are single-tube teeth crowns.

meet in the center at the point where the vertical tube intersects them, as in Fig. 178, B. These curved blocks overcome the disadvantages which sometimes arise from employing the ordinary straight single or double-tubed rods, whereby the horizontal posts are apt to project either on the labial or lingual surface, as mentioned in Chapter X and shown in Fig. 126 (see COSMOS for November 1914, page 1224). They also do away with the necessity for drilling vertical tubes in certain cases where this might be necessary. They are also useful for the purpose of shaping up plain sections of 2 or 3 teeth, gum block sections, removable facing sections, and for many other purposes. (Fig. 179.)

By the use of these sections any desired curve of arch can be obtained, while sufficient material is available to permit of any form of irregularity being reproduced. With regard to the tubes, experience has shown that the distance between the center of the canals of the canine and central incisor of either side is about 10 mm., irrespective of the width of the crowns of the teeth; but should the canals be wider apart, or closer together, the porcelain tubes may be reamed out in the direction required, or one or both posts may be resoldered to the cap, as mentioned in Chapter VII, page 940, COSMOS, August 1914.

The object of the central tube is to provide for a post in a lateral incisor where this may be necessary; but, as it is likely to be less frequently required than the other two, a smaller tube only is provided, and this can be enlarged, if need be, by means of one of the special diamond reamers.

Lastly, with regard to the horizontal tubes, these are for the purpose of providing additional strength and anchorage, as shown in Fig. 178, B, and the horizontal tubes in blocks Nos. 36, 37, and 38 are all situated 4 mm. from the bottom edge, as in Fig. 178, C; and the purpose for which this is intended is to provide for the tube's being so situated with regard to its relation to the teeth and gum portion, or to the crowns where crowns only are used, that the horizontal post need not be exposed during the shaping-up process.

Where either a vertical or horizontal tube is not required, it can readily be filled by means of a section of post cemented into it, and here it may be well to state how this may be done in the case of a bridge formed from a straight porcelain rod with single or double tubes, and the method is applicable in a similar manner to curved blocks also. Where the continuity of the tube is not broken by intersecting vertical tubes, the horizontal post or bar may be cemented to place in the manner described in Chapter XIV, but where

vertical posts entirely obstruct the passage of the horizontal one, a section of

Fig. 180.

Shows how each short length of wire is cemented in from either end.

post or bar should be cut off equal to the length of the tube between the points A and B, Fig. 180, and cemented to place.

Cutting-off Sections from Porcelain Rods.

In the chapter on grinding and shaping, the use of a thin carborundum wheel was recommended; and this serves the purpose well in many cases, but it is open to one serious drawback, namely, the liability of the wheel to "jam." When this happens, the wheel is almost certain to break. This is not to be wondered at when one notes that these wheels are thick in the center, and tapered toward the edge. It follows, then, from their shape that the deeper the cut the greater the amount of friction on the sides of the wheel, hence the greater the danger spoken of. Elastic base wheels meet this difficulty admirably, indeed for industrial purposes they are exclusively employed in work requiring thin or narrow cuts. At present similar wheels are not procurable for our purpose, although they are made for industrial purposes as thin as 1/32 inch up to 4 inches in diameter, 1/16 inch thick up to 8 inches in diameter, and they have been made as thin as 1/64 inch. An efficient substitute will be found in a brass disk 4 inches in diameter, thickness about 17 U. S. gage, and fine carborundum powder mixed with oil. The oil and carborundum powder may be used on a small piece of sponge in the same manner as water for keeping wheels wet while grinding. The use of oil is attended with one disadvantage. The fingers become soiled with the débris from the wheel, which is difficult to remove; but a solution of sugar and water,

Fig. 181.

Cut made in porcelain rod No. 25 with a brass wheel, using Columbia lathe at lowest speed with carborundum powder and sugar mixture. Time taken, 70 sec.

in place of oil, etc., while equally effective, does away with this. (Fig. 181.)*

The Use of Tube Teeth, Single or Double Tube Rods, or Porcelain Blocks, for the Purpose of Forming Removable Facings or Interchangeable Teeth.

In the chapter entitled "Superiority of the Tube Tooth," page 699, Cosmos, 1914, it was pointed out that in certain cases of abnormally close bite the whole of the porcelain covering the lingual surface of the post either of a tube crown or of a tube tooth attached to a plate, might be ground away and yet leave the porcelain facing as strong, if not stronger, than an ordinary plain tooth unprotected by a backing: because in such a case the porcelain face would be supported in the whole of its length, provided the post was not ground too far through. Figs. 41 and 42, in Chapter IV, illustrated the amount of anchorage which would thus be obtained in the case of a tube tooth or section of porcelain rod, as well as when a double tube rod or porcelain block is employed. It will also be observed that it is greater in the case of the former than the amount of anchorage provided by any of the well-known forms of removable facings, while in the case of the double-tubed rod used

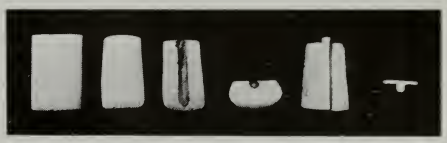
* The writer hopes to deal much more fully later on with the subject of grinding materials and methods.

in like manner, the amount of anchorage obtained is greater than is afforded by any form of plain tooth, due to the fact that the anchorage tubes extend from the incisive edge—or, in the case of the back teeth, to the crown surface of the tooth or facing—to the cervical border. Moreover the disposition of the tubes one on either side of the middle third of the tooth adds greatly to its strength, for the reason that a hold is obtained over the widest possible area. Thus, these facings may be employed for any or all of the purposes for which plain teeth, interchangeable teeth, or removable facings are employed. When used for vulcanite work they require no anchorage post, although a simple form of anchorage, or anchorage and strengthener combined, can easily be formed. The tube tooth, when it has been ground away in the manner to be described, has far more of the character of a natural tooth than any of the ordinary forms of plain teeth, for which it can be so readily substituted. Moreover, all of the double-tube rods and porcelain blocks spoken of may be used to form two or more removable facings joined together in a manner similar to the illustrations already shown of tube crowns treated in this way, and the claims which have been advanced in favor of those multiple crowns where the tubes are used vertically are likewise applicable in the case of removable facings. In consequence, they permit of a much wider application of the principle than appears to have been hitherto suggested—while others will doubtless suggest themselves to the reader.

To Form a Removable Facing from a Tube Tooth or Porcelain Rod or Block.

This is a very simple matter. In the case of one of the older forms of platinum tubed teeth the platinum tube or lining may be retained or removed. If for any special reason it is decided to remove it, this may be done by means of a cross-cut bur before the tooth is ground through to the tube on its lingual surface, or afterward, when it may sometimes be dislodged without much difficulty by means of a sharp instrument; failing which, it may be removed by means of a cross-cut bur as described. The lingual surface should first be ground off by means of the large 4-inch wheel, $\frac{3}{8}$ inch or $\frac{1}{2}$ inch thick, until the

Fig. 182.



A B C D E F

Removable facing formed from single-tube rod. A, Section of tube rod. B, Tooth roughly shaped up. C, Lingual view of facing. D, Incisive view. E, Backing. F, Edge view of backing.

tube is nearly exposed. It should then be ground quite flat by being held against the side of the same wheel, which should run perfectly true. But, previous to being ground, a post should be temporarily cemented into the tube or tubes to act as a guide to the amount which should be ground off, and at the same

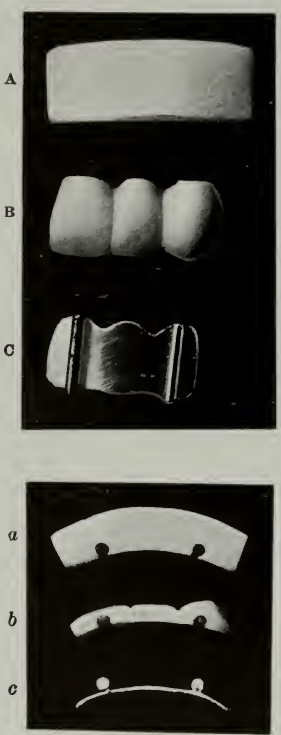
Fig. 183.

Central incisor facing formed from double-tube rod No. 27, with backing.

time to preserve the ground edges of the tube. Care should be observed merely to expose the platinum tube. If a doubt should exist about the lingual surface being perfectly flat, the tooth facing should be rubbed down or ground on a flat carborundum hone with water or oil, using a rotatory motion. When a facing is formed from a tube rod, a section

should be ground down nearly to the level of the tube, and then cut off, and the preparation of the lingual surface completed in the manner described. The facing should then be ground to the desired shape in the usual way. Fig. 182 shows the various stages. In Fig. 183 is a facing formed from a double-tube rod.

Fig. 184.



A *a*, Labial and incisive views of section of block No. 33. B *b*, Shaped up. C *c*, Labial and incisive views of backing.

In the case of two or three facings formed from a double-tube rod, the lingual surface may be ground in the same way, or, better still, it may be hollowed to conform to the arch (Fig. 184), and the facings then shaped as described in the section on "Grinding and Shaping." When three facings are formed from a double-tube rod, the lingual surface of the section of porcelain should also be hollowed out in the manner suggested, otherwise the arc of the circle representing the labial surface of the teeth can only be obtained at the expense of needless thickness of the teeth, with its attendant disadvantages.

In grinding the concave surface of the block down to the tubes, a wheel 1, 1½, or 2 inch diameter and ⅜ inch or ½ inch broad, grit 80 to 100, should be employed, and a finer one, about grit 150 and of the same size, for final grinding. Great care should be observed not to carry the grinding too far; the point where it should cease is when the tubes are only just exposed evenly along their whole length, or it may be stopped short of this by about the thickness of note-paper, when the tubes may be further exposed in the whole of their length by means of a thin S. S. W. Vulcarbo disk, No. 3, 6, or 7. In the event of interchangeable teeth or removable facings, either single or multiple, being manufactured, the tubes might with advantage in many cases be size No. 3, therefore similar in size to the tube of the platinum tube tooth, but of course not lined with platinum. This would permit of a thinner facing, an advantage which though seldom necessary, would not entail any sacrifice of strength which could not be well spared, and it would still leave these facings stronger than any others.

Fitting a Backing to a Tube Facing.

In order to form a backing for a single-tube facing, take a piece of perfectly flat backing, and scrape it lightly in order to obtain a bright clean surface which will solder readily. Then take a length of straight wire which will accurately but easily fill the tube, and lightly scrape it also along the surface which is to be soldered to the backing. Now tie the wire and backing together by means of thin binding wire, and having boraxed the surfaces which are in accurate contact, apply a very small piece of solder to the joint and flow the solder carefully but thoroughly in the Bunsen flame. If

this has been done carefully, the facing, after the backing has been pickled, should slip on easily. Success depends upon using the smallest possible amount of solder which will form a union of the parts and no trace of solder should be visible after the operation is completed. Where a double tube is employed, the procedure is similar, although the details are necessarily somewhat different. The first post may be soldered to the backing in the manner described; the second post may have its relation to the first one (on the backing) determined by using a short

Fig. 185.

Shows section of double-tube rod used as a guide for fixing position of wires to backing for soldering.

length of tube rod cut from the same porcelain rod placed temporarily on to the post at each end (Fig. 185), the post or wire tied to the backing, and the porcelain sections or guides withdrawn —leaving, of course, the second post in its proper relationship to the first—when it should be soldered to the backing in the way described. Instead of the sections of porcelain rod being employed as a templet or guide, two small permanent guides or templets made of brass may be used, one set for each of the double-tube rods. An alternative method is to solder both posts to the backing at the same time; or the backing and posts may be invested and then soldered, or a cast backing may be used, backing and posts being cast in one piece.

A Repair Facing.

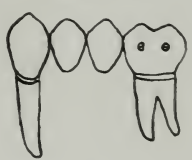
A repair facing may be formed in the manner shown in Fig. 186, and this may be done by cutting off a thin section of

Fig. 186.

Stages in the formation of a repair facing from double-tube rod No. 26.

a double-tube rod in the manner already described. Such a facing will often be found of use in replacing a molar or bicuspid facing broken off a crown or bridge, using the existing pins or anchor screws for the purpose of obtaining anchorage. (Fig. 187.) The position and size of the hole will allow of ready adjustment, and the facing may be ce-

Fig. 187.



Molar facing fixed with anchor screws.

mented to place in the usual way, or a combination of cement and amalgam, or cement and porcelain cement, may be used. Should one or both pins come away with the porcelain facing of a molar or bicuspid crown, the remaining portion of the pins which may adhere to the backing should be ground off, and two holes drilled and tapped in the backing, and a headed screw screwed into each, or two short How screws used, and the facing cemented to place.

A Further Consideration of the Question of Tubes and Posts.

For ordinary purposes the size of the tube in the non-platinum tube teeth and rods is all that could be desired, but, as previously mentioned, there are conditions which call for modification. For instance, the size of split or solid posts best suited to all cases cannot be arbitrarily fixed, neither can the size of metal tube or the thickness of its walls be dealt with in this way. In consequence, the writer begs to withdraw the suggestions of the table on page 610, May Cosmos, 1914. It is to be understood that the reader must judge for himself as to the size of the posts and tubes which will best meet the circumstances of exceptional cases. There are one or two points, however, which will serve well as a general guide: A split post should be stouter than a solid one. Where a solid post No. 13 U. S. gage is used, a split post No. 12 U. S. gage would generally be as strong. Metal tubes should be quite thin when they are surrounded by an inlay or used for lining a porcelain tube.

(To be continued.)

PRINCIPLES OF CAVITY PREPARATION.

By H. W. P. BENNETTE, M.D.S.Liv., L.D.S.Eng., Birkenhead, Eng.

(Report presented to Section III, Sixth International Dental Congress, London, 1914.)

IT does not enter into the province of this paper to discuss the advantages or disadvantages of the cast gold inlay as compared with the foil filling, nor do I intend to do so, beyond stating my belief that the cast inlay affords us a better means of restoring to full functional activity any tooth which has been attacked to any appreciable extent by caries, than does the foil filling.

It must not be understood by this that I have discarded the foil filling, but that I have limited its use to small cavities which have a box-like formation, that is to say four walls and a floor, and which do not call for a contour restoration.

For convenience of description, I will divide the types of cavities into three groups:

(*a*) Those rendered necessary, or brought into being, by imperfections in development, such as fissure cavities or pits.

(*b*) Those which occur upon smooth surfaces.

(*c*) Those which involve both of the above.

In group (*a*), I use the words "rendered necessary by imperfections in development"—wishing to imply that I do not hesitate to cut out faulty fissures or pits, even though they are not as yet seats of caries.

The reasons for treating carious teeth are two, namely, the removal of diseased tissues, and secondly, the restoration in full of these lost tissues.

Bearing this in mind, I invariably divide my operation strictly into two sections, and therefore never begin to shape up a cavity until I have completely removed all affected parts.

Technique of Cavity Preparation.

The first step in the operation is to break down all frail enamel margins by means of a freshly sharpened chisel, cutting until hard, healthy enamel is reached in every direction.

When this has been done, as much of

the carious dentin as can be removed by the use of excavators is cut away, the cutting being done from points near the center of the cavity toward the circumference in order to avoid undue pressure and consequent pain being inflicted upon the pulp.

When it becomes difficult to remove partly infected dentin by this operation, a suitable rose-head bur is used, and by this means all unhealthy dentin is removed. If at this stage any overhanging enamel margins are present, they should be removed by means of a convenient sized carborundum stone moistened and used with a light steady touch while revolving rapidly in a true-running handpiece.

I use stones in preference to burs for all trimming of enamel margins, as I consider they cut better and are less painful to the patient—to say nothing of the speed the work can be done at, and the finished surfaces they give. Small knife-edged stones used in either the straight or contra-angle handpiece are particularly useful for opening up fissures, especially where there is little or no caries present.

At this stage, and not before, should the shape of the cavity and the position of the cavity margins be finally decided upon. At this point also, pulp or root treatment, as the case may be, should be taken in hand, and generally speaking completed before passing on to the rest of the operation of preparing the cavity for the reception of the inlay.

The above description serves for every form of cavity met with.

It would be quite impossible in a paper of this length to go into the minute details in the preparation of even all the most typical cavities we have to deal with. I shall therefore attempt so to word my description as to cover the majority of them.

SHAPING OF CAVITY MARGINS.

First, let us consider a typical case in group (*a*).

Assuming that all infected tissue has been removed, and leaving out of consideration any pulp or root treatment, we must decide upon the position to be occupied by the cavity margins.

Here, as in all cases, due regard must be paid to the chance of the recurrence of decay, and the joint between healthy tooth and metallic restoration must lie in the region of comparative immunity. This on all occlusal surfaces is, practically speaking, at every point except the defective fissures, so that when these have been freely cut away the cavity margin occupies a position of safety. Sharp corners, such as lie at the junction of the fissures, should be rounded off in order to simplify the cavity as much as possible.

SHAPING OF CAVITY WALLS.

This being done, the next step is to shape up the walls of the cavity. The floor, or pulpal wall, should be made as flat as possible, and the remaining walls should be as near a right angle to this as it is convenient to make them. In practice this angle will be slightly obtuse; but it is wise to make it as little so as possible.

The best procedure in my hands for bringing this about is first to cut the floor with the face of an inverted-cone bur, taking care not to undercut the walls, then proceed with a Dall's inlay bur and finish off with either a drum-shaped stone or else with an old fissure bur covered with moistened carborundum powder. This gives a smooth surface, and insures cutting the face of the wall in its entire depth at one time. The angles made by the perpendicular walls with each other should be rounded and follow the line created by the margin of the cavity.

At this point, if I have any doubt about being able to withdraw my wax matrix, I soften some gutta-percha and force it into the previously moistened cavity, let it stiffen and then carefully remove by fixing a heated sprue, which when cold can be seized by dressing-pliers. If it leaves the cavity easily all is well, and in any case a careful examination of the plug often suggests

some slight modification or improvement in the shaping of the cavity.

PREPARATION OF THE CAVO-SURFACE ANGLE.

The last step, but a most important one, is the treatment of the cavo-surface angle, and with Dr. J. V. Conzett and others I lay particular stress upon this part of the preparation. I prefer a long bevel, taking in the whole thickness of the enamel. This requires care and a good deal of patience. In the type of cavity at present under discussion, I find a cone or drum-shaped stone of great use.

When this surface is carefully polished I consider the cavity is ready to receive the wax from which the matrix is to be made. This paper is not concerned with this part of the procedure, but it is well to examine the pattern when obtained, and to learn from it whether the cavity preparation is all that it should be, or not; if not, it can still be remedied.

Quite a common complication of this simple class of cavity is where a defective groove extends over the buccal or lingual surface of the tooth. In this case the treatment is the same. The pulpal wall is extended and becomes the floor of the groove, the walls are at right angles to it and the cavo-surface angle is beveled; obviously the occlusal end of this groove is wider than that which approaches the gingival margin, for the convenience of withdrawing the wax pattern. In the cases where this groove leads into a pit which when cut out is larger than the width of the groove, I prefer to treat it as a separate cavity rather than sacrifice too much healthy tooth substance.

The pits formed on the lingual surfaces of the upper incisors need no more description than the above, as they should be simple box cavities.

LABIAL AND BUCCAL CAVITIES.

To pass now to those cavities which occur upon smooth surfaces. Very little further description is required for this type of cavity. The most common examples are those which are situated at the gingival margin on the labial surfaces of incisors and canines, and the buccal surfaces of premolars and molars.

Here the floor or pulpal wall should be flat and the surrounding walls at right angles to it, and the cavo-surface angle beveled, except in the region where the cavity margin passes beneath the gum. Here I prefer a face joint, for the simple reason that it can be practically finished out of the cavity, and thus avoid damage to the soft tissues; it also occupies a region of immunity.

The only cavities on the mesial or distal surfaces that I treat in the above way are those which are situated in teeth which have lost their neighbors, and where the enamel and dentin on the occlusal boundary are strong and healthy. All other cavities which have their origin on these surfaces I open up to the occlusal surface and treat from there.

MESIO- OR DISTO-OCCLUSAL CAVITIES.

One description for all mesio- or disto-occlusal cavities must suffice:

All defective tissues having been removed, the cavity margins are extended to those regions which are comparatively immune from decay. The gingival margin should occupy a place just beneath the gum, and the buccal and lingual margins, which should be parallel or slightly divergent at their occlusal ends, should meet it in slightly rounded-off angles. The occlusal margin will depend upon its position on the condition of the fissures on that surface. If these are involved they must be cut out as described above and the two cavities must merge into one another. The gingival wall should be cut flat at right angles to the long axis of the tooth, and the pulpal wall should meet this at a right angle. The gingival wall may here be considered as the floor of this portion of the cavity. The remaining two walls, buccal and lingual, should meet both the gingival and pulpal at right angles.

or if there be sufficient tooth substance to allow of it without risk of weakening, these two walls may occupy a position at an angle which is slightly acute with the pulpal wall. If this is not possible or is undesirable, anchorage may be obtained in most cases by either broadening the end of the fissure or occlusal portion of the cavity which is distant from the main portion, or drilling a depression in the pulpal wall of this portion of the cavity.

When this is done nothing remains but to create the cavo-surface bevel and take a test wax pattern. The object is so to form the cavity that the wax matrix can be withdrawn from it in an occlusal direction.

If the fissures are not involved, I find the simplest form of retention is to make the bucco- and linguo-axial angles slightly acute, and if possible increase this tendency as the occlusal surface is reached. This, together with a flat gingival floor, an accurate contact-point restoration, and good occlusion, is sufficient to retain any medium-sized inlay in this position.

If the root-canals have had to be treated, additional retention can be obtained from this source by means of a post of iridio-platinum wire around which the inlay can be cast.

MESIO-OCCLUSO-DISTAL CAVITIES.

In those cases where both the mesial and distal surfaces are involved, it is necessary to make one complicated cavity. The preparation is the same with this addition: The cusps are deliberately reduced, so that they may be reproduced in gold. This is particularly necessary in the case of upper premolars. In this way the risk of splitting either half of the tooth during mastication is reduced to a minimum.

APPROXIMAL CAVITIES IN ANTERIOR TEETH.

It only remains now to give a brief description of the preparation of cavities situated in the approximal regions in the anterior teeth. Generally speaking, these cavities can be made fairly simple by quite freely opening them up from the lingual aspect. The margins are extended in every direction until the safety line is reached. If the cavity is one which does not involve the incisal edge, sufficient retention can be obtained by preparing it as follows: The gingival margin is placed beneath the interdental portion of the gum tissue, and merges into the labial margin, which extends as far as the mesio- or disto-lingual angle of the tooth. The lingual margin is brought into existence by the preparation of the pulpal or axial floor.

The gingival wall is shaped so as to be at right angles with the long axis of the tooth, and the axial wall is made at right angles to the gingival wall. This is accomplished by opening up the cavity from the lingual aspect with small stones or fissure burs held in the contra-angle handpiece, great care being taken not to remove all healthy dentin from the back of the labial wall. This operation virtually forms the labial wall, which thus makes a right angle with the axial wall. It will be seen also that this forms the lingual margin of the cavity. Sufficient retention can then be obtained by prolonging the lingual margin and the portion of the axial wall adjacent to it, both in the direction of the root and the incisal edge of the tooth—thus forming a dovetail. This portion of the margin and a small portion of the extremities of the labial and gingival margins can then be beveled and the cavity is ready for the trial wax pattern.

Those cavities which involve the incisal edge must be prepared on slightly different lines to the previous variety. Additional retention must be obtained on account of the extra strain to which the filling will be subjected during mastication. In a large number of these cases where so much restoration is called for, the pulp has been involved and we have the root-canal at our disposal by which to secure a strong anchorage. In those cases where the pulp is alive, additional hold is obtained by treating the

lingual surface of the tooth as though it were an occlusal surface, and following the same principles of retention as described for mesio-occlusal cavities in the molar region.

Much more could be written on this subject, but I think the above description to some extent covers the chief points in the principles of cavity preparation.

A NOTE ON THE TREATMENT OF HABIT SPASMS.

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(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, at its fall meeting, New York City, November 28, 1914.

AS the purpose of this paper is to deal with a particular line of treatment of habit spasms, it is not my intention to burden you with a lengthy discussion on etiology or pathology, or to attempt to classify the variety of conditions leading up to these.

SCOPE OF PAPER.

I will merely refresh your memory that these include the various tics, chronic facial spasms, spasmodic torticollis, purely mimic spasms, and organic post-paralytic tremors and spasms.

In many cases there is a natural or acquired instability of the subconscious reflex centers. In others, apparently healthy, the repetition of a certain movement or trick becomes first involuntary, then automatic, and finally exaggerated. They also depend on a well-known principle that nervous impulses have a tendency to travel more easily along a track they have traveled before.

It should always be borne in mind that there may be an organic basis for the condition; especially in the cases in which you are interested, the fifth nerve may be in operation.

The teeth, the ears, the eyes, the throat—all should be thoroughly examined. Diseases of bones through which the nerve may pass, also all the structures in relation to the nerve, should be taken into consideration.

CONSIDERATIONS IN TREATMENT.

In the treatment of habit spasms, the first consideration should be to give the fullest attention possible to the general constitutional condition of the individual, to raise this to the highest possible state of efficiency, and above all to make the most painstaking search into his environment.

There are cases which need no more than a complete removal of the circumstances which gave rise to the habit, to effect a complete cure. It should be borne in mind that in many instances the parents are unaware of the condition, and in some instances the victims themselves of the habit are entirely unconscious of the spasm, and unable to appreciate it on its occurrence. I may say here that I think it a most essential preliminary to successful treatment that the individual be taught to pay close attention to his sensations, so that he may acquire the capacity of appreciating the movement on its occurrence.

The treatment I propose to outline depends entirely on the intelligence or rational co-operation of the patient. It is therefore necessary that he should be quite capable of perceiving at all times

the slightest tendency to the movement we wish him to correct. This treatment has always been a matter of exceptional difficulty, and the result is often unsatisfactory because of the constant tendency to recurrence of the condition. The method employed in the cases which I showed you this afternoon is based more directly on clinical experience than on scientific evidence deduced from experimental work.

The precise psychological process is fully open to discussion, and I do not intend to defend any particular view in explanation of the phenomena. I propose briefly to explain to you the technique, and the inferences we have drawn from clinical observation.

TECHNIQUE OF TREATMENT.

We know that muscular contracture may be initiated in the cord or cerebral cortex, and we know also that these contractions can be controlled by psychic impulses acting on the cortical cells.

Clinical observation leads us to believe that in conditions of muscular spasms, no matter how initiated, the tendency to control this is by means of a psychic impulse through the cortical cells which control a muscle group of muscles of *opposing* action.

Observation also leads to the conclusion that in cases where there are *unopposed* muscle groups, as in the case of some sphincters, the constant overaction of the lower center seems to predominate, and an effort on the part of the higher centers in making active efforts to overcome it directs attention to the pathological spasm, and results not only in failure to control it, but often serves to accentuate the stimulation and increase the spasmodic state.

It is well recognized that in sleep, though no conscious effort can be made to control habit spasms, they are usually entirely absent. Beginning with this observation, our endeavor should be to teach our patients to assume a state of muscle tone similar to that which obtains during sleep, and this is what we try to accomplish. In order to do this, they are first taught how to acquire control over emotional states.

Next, we employ a method by which they may improve their capacity to concentrate their attention on the exercise which will lead to muscle control; and finally they are taught, step by step, not only the exercises, but their application in daily life, by which means they will acquire a capacity to control the spasmodic conditions, and develop a habit of poise and of repose—a condition the opposite of that which is responsible for the spasms from which they have suffered.

The first step in controlling the emotional state is based on the much-disputed theory of James and Lange, in which it is contended that the emotional state is always consequent on the physical state, and that the physical state is the immediate source and precursor of the emotion.

According to this theory, when we receive a mental shock, our heart beats quickly; all our breathing comes in short and hurried gasps, or our peripheral arteries undergo changes of contraction or dilatation, and the resultant is a physical sensation which leads to the psychic emotion we term fear. Fear, without visceral change, cannot occur; absence of visceral change implies absence of emotion. This theory, though not universally accepted, finds ample confirmation in clinical observations. It is our constant experience that patients who are excitable, despondent, or worried, or fearful of their ability to walk through crowded streets, or to speak in public, may readily, by controlling visceral change, subdue the rising emotion, and accomplish their purpose entirely free from the state of fear which otherwise had overwhelmed them.

DEEP BREATHING.

It is now an accepted fact, that deep breathing reduces the rate of the heart's action; it necessarily also diminishes the rate of respiration; it increases the influx of blood from the abdominal to the thoracic viscera, and that of air into

the lungs, and so promotes better oxidation of a greater volume of blood in a given time.

Deep breathing is therefore the first means we have adopted for controlling the emotional state. In order to make this as efficient as possible, we aim from the outset of our exercises to increase the muscular development, the forcibility of contraction, and the willed control of the action of the diaphragm.

We insist on voluntary control of this muscle throughout the initial exercise because of the undisputed fact that intentional movements exercise a much greater trophic influence on muscle fiber than uncontrolled movements, and for the further reason that it is a simple and efficient manner of beginning to teach the dicipline of close attention to the exercise.

ROUTINE OF EXERCISES.

In the first lesson the patient lies on his back, with the waist line entirely loose. The hand of the operator is laid on the abdomen, with a moderate degree of pressure, and the patient is taught to lift the weighted abdomen by inspiratory effort only.

The pressure is gradually increased, and the duration of inspiration, of expiration, and the period of pause varied at the will of the operator—a metronome being used to measure accurately the time devoted to each phase. Inspiration, expiration, and the pause between each act is timed, and the movements persisted in until the patient is capable of controlling the depression and elevation of the diaphragm. He is taught to breathe entirely abdominally.

Advantage of abdominal over thoracic breathing. It may be well to lay some stress here on the advantage of abdominal breathing as opposed to thoracic.

We know that the lungs are cone-shaped, the upper apical portion being therefore much smaller than the basal parts.

No matter how vigorous a thoracic breath is taken, and how great the consequent chest expansion, there is a tendency to hold the bases of both lungs tightly compressed against the vaulted diaphragm; to lift the shoulder girdle, and so diminish the air pressure in the upper third of the thoracic cavity, into which the air rushes, and where practically all the aeration that takes place is carried on. In this manner we use far less than half of our available lung tissue. In abdominal breathing, on the other hand, with practically no muscular effort, the diaphragm is depressed, and there follows in consequence a considerable degree of negative pressure in the lower two-thirds of both lungs, and the air literally drops in, aeration being favored in about two-thirds of the available lung tissue.

This is readily appreciated by anyone who will take a deep thoracic inspiration, and note in his own person the amount of muscular work done, and the relatively small amount of air which enters the lungs, while, on the other hand, if an abdominal inspiration be taken by simply depressing the diaphragm, one will not fail to note the striking contrast—the small amount of effort entailed, and the greater volume of air which rushes in.

Having accomplished the technique of deep breathing, the patient is able to practice at home or at work; sitting, walking, lying, or standing, and so acquire immediately the benefits of a diminished tendency to emotional states, and a better aerated blood.

Vigorous deep breathing, however, if persisted in for long, leads to a dyspneic state, but we have found that from twelve to twenty deep inspirations taken consecutively may be considered a safe and sufficient exercise at any one sitting, and is never likely to lead to any discomfort.

As soon as the patient masters the mechanism of abdominal breathing, the guiding hand of the instructor should be replaced by a sandbag weighing about from two to four pounds.

CONCENTRATION AND CONTROL OF IMPULSES.

With the now improved control of the diaphragm, the next step is to acquire

during waking hours the slow, satisfying rhythm of sleep. This is characterized by a deep inspiration, a rather rapid, uncontrolled expiration, and a relatively prolonged pause between the second and first act. This method of breathing is quite characteristic of one sitting or lying in a state of complete tranquillity who is unembarrassed by tight clothing around the waist.

The patient's capacity for concentration is now further developed by teaching him to give his undivided attention to the sensation of air as it streams over the mucous surfaces of nose and throat and distends the abdomen in passing in and out of the body. By thus riveting his attention on this rhythmic sensation, he learns readily to exclude all the distractions and imagination and memory, and gradually, with each succeeding lesson, his capacity for concentration improves.

Having now improved his ability to focus his attention, he is taught to relax his muscles. This is attained by repeated passive movements, the object of which is to increase the acuity of his perception of the impulses of joint sense and of muscle sense. It is upon the adequate development of this sense that efficient control of muscular movement rests—whether physiological or pathological. The patient must be taught to rest in a state of perfect muscular relaxation, and the control of his impulses must be such that any group of muscles may be moved in any direction by the operator, while he lies absolutely inert, not aiding and not resisting in any degree.

The operator, by constant practice, readily detects the slightest muscle change in the limb which he is manipulating, and by a word warns the patient of the fault, and the movement is persisted in until it is quite evident that the limb throughout the movement has been entirely passive.

It will be seen that this is a definite and rational endeavor to teach the patient to use his own will-power to control the tendency to abnormal muscular contraction by showing him how to acquire complete mastery of normal muscular movement.

DIFFERENCE FROM HYPNOSIS.

Some efforts have been made to liken this method of an hypnotic state, but I am unable to see anything in common with hypnosis.

The hypnotic state, it is well known, is a fatigue phenomenon, dependent on complete exhaustion of the higher centers, depriving an individual of his will-power and leaving him in a state so receptive to the will of the operator that he has no choice but to obey. In this condition, by the constant exercise of attention and by the effort of will required for the performance of this monotonous exercise, the higher centers are brought more definitely under immediate psychic control, and are maintained in a state of quiescence by a purely voluntary act.

In strong contrast to the hypnotic state, we find that the more intelligent the patient, the quicker and more satisfactory the result, and the more clearly the patient is able to understand what is required of him, the more complete is his mastery of the technique throughout the exercise. He must be as watchful and as alert as in the exercises of boxing or fencing.

INDICATIONS FOR THE METHOD AND AN OBSTACLE TO THE TREATMENT.

This method of treatment has been found beneficial in a variety of conditions. In collaboration with Dr. W. J. Maloney, I have already published notes on the treatment of high vascular tension, organic conditions such as paralysis agitans, hemiplegia, and tabes dorsalis.

It is also found highly beneficial in the treatment of inco-ordinate speech—stammering—but it is particularly in these purely habit spasms that one may look for quick results, and hope for their maintenance.

A disadvantage of the method of treatment is that it takes a great deal

of time. The sitting should be conducted in a quiet room, well shaded, and preferably with no third party present, the last being a source of distraction which the average patient finds very great difficulty in setting aside. One often has practical experience of this in demonstrating the method to doctors, particularly in cardio-vascular cases when the object is the reduction of high blood pressure. Not infrequently, when being demonstrated on a patient in the presence of his doctor, the pressure may fail to fall, or may even rise, yet when after a lesson or two, the doctor conducts the sitting himself, alone with the patient, he is able to obtain the desired result.

As an offset to this disadvantage, however, the treatment is so simple that an intelligent parent or nurse is quite capable of mastering the technique.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

SYMMETRY IN DENTAL CARIES.

By I. S. WECHSLER, M.D., D.D.S., New York, N. Y.

MANY dentists have no doubt observed the symmetric occurrence of caries in various teeth. Recent work in the mouths of children served to call the writer's attention to the extreme prevalence of symmetry in decay. In fact, the symmetric condition seems to be so extensive that the vast majority of all cases are actually characterized thereby. Although sufficient data in adults were not at hand with which to compare those obtained from deciduous teeth, it seems that the latter show a greater tendency toward symmetry than do the permanent ones. Also, of all teeth, the first permanent lower molars are perhaps most often symmetrically affected. So far, indeed, does the likeness in the corresponding teeth go, that one almost feels as if the decay has been induced with a purpose.

OBSERVATIONS OF SYMMETRY.

Aside from the fact that the decay is symmetric, it is also synchronous, *i.e.* it is so when the case presents itself to the dentist. Observation, however, seems to show that one tooth is usually first affected, and after some time—the period varying, of course, in different cases, depending as it does on various causes—the corresponding tooth begins to give way. This point may have some importance, as we shall explain later.

Generally the symmetry refers to the corresponding quadrants of the jaw, *i.e.* right to left lower, right to left upper. But we may also consider opposing teeth, *i.e.* right upper to right lower. The latter condition would really not come under the caption of this article, but as it, too, seems to be prevalent, it may be that there is some connection between the two conditions. The symmetry exhibited in the cases under consideration, figures of which are given below, seems to be the result of various underlying causes; for not alone do we find points of caries in corresponding teeth in positions where similar anatomical peculiarities would account for them, but we also find them where no structural condition alone will explain them. Thus, for instance, caries in the mesial surface of a right second bicuspid ought, by proximity, to affect the distal surface of the right first bicuspid, but this is very often not so. Instead, the mesial surface of the left second bicuspid is found to be involved. And so we find caries apparently crop up in corresponding teeth, situated in different segments of the

jaws; whereas, according to our accepted notions that caries develops best where bacteria have an opportunity to lodge, the decay ought to attack the tooth touching the one already affected. But while this happens often, the condition to which attention is here called occurs just as often, if not more so.

CLINICAL OBSERVATIONS.

In the following a few figures are presented: In 88 cases of children we found the corresponding upper teeth to be involved in the same mouth 42 times, in crossed and opposed teeth 36 times, and in both upper and lower, right and left —that is perfect symmetry—in 7 cases. Only 8 cases of the whole number were so irregularly affected that no symmetry was discerned.

Now it may be that the figures just quoted are not really characteristic, if for no other reason than that the cases are too few; but they were obtained at random and as a matter of routine, therefore it is quite likely that other cases would show similar conditions. However, these data seem to be so striking that one cannot ignore the fact that caries in one tooth is apt to occur symmetrically in its fellow on the opposite segment of the same jaw, or even of the opposing jaw.

PROBABLE ETIOLOGY.

What is the explanation? No doubt anatomical peculiarities, which, for embryonic reasons, are apt to develop in corresponding teeth, would be accountable in some cases. But these fissures or pits or faults do not account for all of them; it seems, therefore, that a deeper and more general cause underlies the symmetric decay. This, it seems to me, is a trophic one. The nerves supplying the teeth are at the bottom of this condition. Whether it is through the trigeminal nerves, or, as is more likely, through the trophic filaments, it is of course difficult to determine, but I believe the condition to be entirely attributable to the trophic centers. It would seem that when caries attacks a tooth, the trophic nerves are irritated, impulses are carried up to the center, and through sympathetic channels the carious process attacks the other tooth. This condition is not at all unlikely, as we have similar pathological changes in other parts of the body. It is but necessary to mention optic neuritis, where disease of one eyeball is soon followed by disease in the other, to show that it is very probable that an analogous condition may exist in the teeth.

If symmetry of caries is a real condition which confronts the dentist, and if the trophic nerves account for it, then we may derive therefrom a few interesting lessons in regard to prophylaxis. Whenever caries is detected in a tooth, aside from other various reasons, the carious portions ought to be removed as quickly as possible, not only to save the affected tooth but to prevent extension by sympathy to the corresponding tooth on the other side; also, if the tooth is badly decayed, it is a question whether it is worth while saving it, because we may run the risk of sympathetic affection on the other side, and it would often seem advisable to sacrifice an already badly decayed tooth. Even if the corresponding tooth is involved, but to a lesser degree, the same consideration would hold, inasmuch as the extraction of the tooth primarily affected might prevent rapid extension of the carious process in the tooth which was, as it were, secondarily involved, and preserve its life.

It is difficult to say, from the few cases cited, how much significance we can assign to symmetry as a factor in the phenomenon of dental caries. Surely more cases are needed that we may draw a positive conclusion, but the few instances cited appear so striking that the writer was tempted to explain the condition.

One thing, however, seems certain, namely, that the corresponding teeth are more often involved than anatomical defects would account for. At any rate, it is worth while noting the condition to which I have called attention, and determining the exact significance of symmetry in dental caries.

ORAL SEPSIS AS THE CAUSE OF GENERAL OR SYSTEMIC INFECTION, AND THE DENTIST'S RESPONSIBILITY.

By ANDREW J. SAWYER, D.D.S., Manchester, N. H.

(Read before the New Hampshire Dental Society, at its annual meeting, at Weirs, N. H., June 18, 1914.)

THERE are many causes of oral sepsis, and yet most of them may well be included in the one great cause, which is lack of proper cleanliness.

Oral diseases are so prevalent that it may almost be said that no one escapes.

John Sayre Marshall, M.D., Sc.D., who was formerly examining and supervising dental surgeon in the United States army and president of the examining board, says that during a practice of more than forty years, both civil and military, in which he had examined many thousands of mouths, he never met with but four persons of adult age who were free from any form of dental or oral disease. I wish here to acknowledge my indebtedness to this same authority for much that is contained in this paper.

THE MULTIPLICATION OF MICRO-ORGANISMS IN THE MOUTH.

There have been found more than one hundred different varieties of micro-organisms in the human mouth, and of these more than thirty are pathogenic or disease-producing germs. Miller made the estimate that in a very unclean mouth there were no less than 1,140,000,000 micro-organisms. Another investigator observed that segmentation in the coccus was complete in twenty minutes; but allowing that it takes an hour to complete this process and for the new cell to attain the size of the parent cell, one coccus, multiplying by this process, would produce 16,000,000 progeny in a single day, and at the end of two days 281,000,000,000, while at the end of the third day it would have reached the enormous number of 46,000,000,000,000.

Fortunately, there are conditions which inhibit or prevent this frightful multiplication from continuing indefinitely. One of the chief of these is their own delicate susceptibility to change of environment—the slightest difference in soil, amount of oxygen, temperature, or moisture being sufficient, in many instances, to arrest their growth or completely destroy them.

Remembering, then, that these micro-organisms are ever with us, that they do not originate spontaneously but are always produced by other similar germs, that they may be in the air we breathe, the water we drink, or the food we eat, and that the great danger lies not in the fact of their presence in the mouth, but rather in the possibility that they may suddenly increase in great numbers, giving off their toxins and breaking down the barriers to infection which kind nature has placed all along the way.

IMPORTANCE OF ORAL PROPHYLAXIS.

Under other favorable conditions, their numbers are limited only by the amount of pabulum or food supply; this being true, the preventive treatment which naturally suggests itself consists in limiting that food supply, and this means oral hygiene—extreme cleanliness of the mouth. Dr. Osler, in a recent address delivered before the students of the Royal Dental Hospital of London, said, "You have just one gospel to preach, and you have got to preach it

early and you have got to preach it late, in season and out of season. It is the gospel of cleanliness of the mouth, cleanliness of the teeth, cleanliness of the throat. These three things must be your text through life."

Dr. D. D. Smith, in a paper read befor the New York Institute of Stomatology in 1901, upon "Oral Prophylaxis," said, "It may seem presumptuous to intimate that in the subject of oral prophylaxis, when fully comprehended, are matters of a magnitude to radically modify the present thought and conception of dentistry, and to greatly change the present methods of practice. To advance a step farther and suggest that there are hidden away under the débris of the oral cavity secrets of greater importance to the comfort and welfare of civilization than the great discovery of vaccination by Jenner in 1796 will doubtless seem as a magnification verging upon absurdity—and yet we venture to predict that the future of dentistry will disclose this as a truism." How swiftly has this prophecy come true!

THE MOUTH AS A FOCUS OF SEPSIS.

Sepsis, from the medical or surgical standpoint, is the effect or resultant of the decomposition of dead or necrosed animal tissue, either in molecular form or *en masse,* by a process induced by the action of certain non-pathogenic germs or saprophytic germs, and the formation of ptomains or animal poisons and their absorption by the general system. It also includes infection with pathogenic or disease-producing germs such as the pyogenic or pus-producing, the Koch or cholera bacillus, the bacterium typhosus or typhoid fever germ, the bacillus tuberculosis, and many others.

The human mouth in a diseased condition contains virulent septic micro-organisms, especially those associated with carious teeth containing dead or gangrenous pulps.

Suppurative or septic conditions of the mouth are exceedingly common, and are in a large majority of cases associated with the teeth. Indeed, the fact is recognized that dental disorders are the most common of all diseases that afflict the human race, and that many obscure diseases affecting the general system—such as chronic dyspepsia, gastritis, gastro-enteritis, certain nervous affections, tonsillar diseases, pharyngitis, bronchial and pulmonary affections, certain diseases of the eye and ear, and general conditions such as septicemia and pyemia—may be traced to infection from a septic oral cavity.

A septic mouth is generally, if not always, the result of neglectful habits, due usually to ignorance of the dangers to health and life that result from such conditions. Neglected artificial dentures, improperly constructed crowns and bridges, faulty fillings and inlays, deposits of food débris, salivary calculus, dental decay, gangrenous dental pulps, alveolar abscesses, pyorrhea alveolaris, gingivitis, and stomatitis are all active factors in producing a septic mouth.

Leading dental surgeons have for years been trying to impress these facts upon their profession, their patients, and the medical profession as well, but their plea has too often fallen upon indifferent or deaf ears. But during the last decade much interest has been manifested in this subject, not only by the dental and medical professions but by boards of health, and even by the lay public. And yet there are many professional men who do not seem to realize the importance of controlling or eradicating from our midst the evils of an unhygienic, unsanitary, septic mouth.

The spread of such infectious diseases as diphtheria, tonsillitis, pharyngitis, influenza, bronchitis, pneumonia, and pulmonary tuberculosis among school children is undoubtedly greatly augmented by the unsanitary condition of the mouth in a great majority of the children. The fight that is being waged against the spread of tuberculosis meets with many physical barriers that are difficult to overcome, but with oral sepsis the only obstacles in the way of complete revolution are indifference, prejudice, and ignorance.

THE AVENUES OF INFECTION OF MOUTH BACTERIA.

The avenues of infection of mouth bacteria are arranged by Dr. Miller under six heads, according to their points of entrance:

(1) Infection caused by a break in the continuity of the mucous membrane brought about by mechanical injuries; these may lead to either local or general disturbances. (2) Infection through the medium of gangrenous tooth pulps, which lead to the formation of abscesses at the point of infection, but may also lead to secondary septicemia and pyemia with fatal termination. (3) Disturbances conditioned by the resorption of poisonous waste products formed by bacteria. (4) Pulmonary diseases caused by inspiration of mucus, small pieces of tartar, etc., containing bacteria. (5) Excessive fermentative processes, and other complaints of the digestive tract caused by the continual swallowing of microbes and their poisonous products. (6) Infection of the intact soft tissues of the oral and pharyngeal cavities whose power of resistance has been impaired by debilitating diseases, mechanical irritation, etc.

The most common avenue of infection by pyogenic bacteria within the mouth is through some break in the continuity of the mucous membrane. A slight abrasion or a minute wound such as might be made by a toothpick, a fishbone, or too vigorous use of the floss silk, or an extracted tooth—any of these would furnish a sufficient entrance or point of attack, and might prove exceedingly dangerous in a particularly unclean mouth.

That the presence of pathogenic bacteria in the mouth does not always result in the production of disease is due, in a large measure, to a remarkable resistant power possessed by the mucosa of the mouth, to the power of the blood through the white cells of leucocytes to destroy the bacteria that may enter the system, and to the number that may gain an entrance at any one time.

The process is like a desperate battle waged between two opposing armies; the leucocyte upon the one side and the invading bacteria on the other; and here, as in all other contests, the strongest and most numerous force will conquer.

SOME RESULTS OF ORAL SEPSIS.

The common results of a violent, acute, alveolar abscess are periosteitis, osteitis, osteomyelitis, abscess of the accessory sinuses, and necrosis or death of bone. Such conditions may be productive of very grave results, as they furnish, through the constant discharge of a very virulent pus, one of the most serious sources of auto-infection, both local and general, that are to be found in the oral cavity.

The absorption of ptomains and the entrance of the micro-organisms into the blood and lymph channels are productive of many serious affections in remote parts of the body, dependent upon pyogenic infection and saprophytic or septic intoxication.

Dr. Grieves of Baltimore tells us that in an investigation of some four hundred cases of septic arthritis which he and Dr. Bear of Johns Hopkins University made, it was found that in every case the portal of entry for the infecting germs were blind alveolar abscesses. He also says that in most of these cases bad root-canal work had been done or attempted by dentists.

It is undoubtedly usually true that when pus and pathogenic bacteria are swallowed and pass into the stomach, they are there acted upon by the acid juices and so destroyed; but we must remember that there are considerable periods when the stomach is empty, and that the swallowing of water or saliva does not excite the flow of these digestive juices. It is at such times that these bacteria, as has been shown by Miller, may pass through the stomach and into the intestines, and there, unless they are destroyed by other competing germs, may set up foci of infection or be absorbed by the lymphatics, and thus reach the circulation and find lodgment in any of the vital organs.

THE DENTIST'S RESPONSIBILITY.

We frequently hear it remarked in dental circles that physicians are very ignorant on purely dental subjects. If this be true, it seems to me that in this side-stepping of the human mouth by the physicians, thus leaving to us the care of this most important part of the human anatomy, they are paying us a very great compliment in so recognizing the worth, the ability, and the integrity of our profession.

Are we, as a profession, living up to this great responsibility? And if not, wherein have we failed? These are questions which we may each well ask ourselves.

From great physicians and surgeons we hear more than mutterings of discontent and dissatisfaction with the way the dental profession, as a whole, has met these great obligations and responsibilities. Dr. Osler has pointed out the right direction, but we must do more than preach and teach oral hygiene and oral prophylaxis. We must practice it as well; and we must insist that our patients do their part, for it is only by the honest, faithful co-operation of patient and dentist that anything like success along these lines can be attained. Oral prophylaxis means something more than merely cleaning the teeth and treating the soft tissues surrounding them. It, indeed, includes every dental operation, and our responsibility does not end even with doing each operation skilfully and well. When we have accepted an individual as a regular patient, we have by no means acquitted ourselves of our responsibility to that patient when we have carefully cleaned his teeth, filled the few cavities, and treated the few putrescent root-canals that require our attention. There still remain other and exceedingly important responsibilities. It goes without saying that decaying roots which cannot be made healthy and useful should be removed, and in any case where it is impossible to make an alveolar abscess heal, the root should be amputated or the tooth extracted—always.

A careful examination of the whole mouth should be made to ascertain whether there be manifested therein the clinical picture of any constitutional disturbance which requires treatment, and, if so, the patient should be made acquainted with the conditions and also should be directed to the specialist for treatment.

There are many constitutional disturbances which are often indicated by mouth conditions long before the patient is aware that he is sick or in need of a physician; and to look for and recognize these conditions and direct the patient in the way of health is the duty, the obligation, and the responsibility of the dentist.

What gigantic strides dentistry has made in the last twenty-five years! It is destined to stand at the very pinnacle of all the professions if it lives up to the great opportunities which it possesses; for here we stand at the very gateway, the very door of health. And can there be anything greater or more worth while than the preservation of joyous health in the coming generations?

In the past we have been so intent upon the purely mechanical, and often, I regret to say, the commercial side of dentistry, that we have failed to see or realize these higher duties and responsibilities. As mechanics, we have been more or less content with the wages of mechanics; as professional men we have a right to expect—and some of us have received—compensation such as professional men receive; and as we ascend to the summit toward which we are aiming, we may expect to receive the rewards suited to our higher endeavor, but, best of all, the confident assurance that the world is better morally, mentally, and physically because we have kept clean this "vestibule of human life."

STUDIES OF INTERNAL SECRETIONS IN THEIR RELATION TO THE DEVELOPMENT AND CONDITION OF THE TEETH.[1]

1. Effects of Thyro-parathyroidectomy and Thymectomy.

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(Read before the Dental Society of the State of New York, at its annual meeting, Albany, May 15, 1914.)

I. Introduction.

Mr. President, members of the Society, ladies and gentlemen:

FOR about three years we have been studying, under your auspices, the possible relation of salivary sulfocyanate to dental caries. Dr. Dunning gave you, a few minutes ago, a program of research in this connection that I believe could be followed to advantage if you cared to go farther along that line of investigation. I should be glad to cooperate with you in a continuance of the proposed sulfocyanate inquiry, although, as I suggested last May, "our results have taken sulfocyanate research out of the laboratory, so to speak, and put it into the dentist's chair." I am not competent to undertake the clinical study I have suggested (an outline of which Dr. Dunning has just read to you),[3] because I know too little of the clinical aspects of dentistry. For this reason I suggested here, last May, that I could be of more service to you in a study of the relation of internal secretions to dental pathology. I am here, today, to present some phases of the latter subject for your attention.

When I was first invited, about five years ago, to inaugurate research on dental caries under the auspices of the New York Institute of Stomatology, it

[1] To the substance of the senior author's address before the Dental Society of the State of New York (May 15, 1914), as given in the official stenographic report of it, there have been added various details which were suggested in only a general way by the speaker and promised for this published account of the research. Certain quotations from the writings of various authors, which were included in the oral report, have been omitted here, for the sake of brevity.

The experimental work was done in the Biochemical Laboratory of Columbia University at the College of Physicians and Surgeons, under the auspices of the Research Committee of the Dental Society of the State of New York, Dr. Wm. B. Dunning, chairman. The experiments on thymectomy, by our colleague, Dr. Pappenheimer, to which free reference is made, were conducted in the Pathological Laboratory of Columbia University, at the College of Physicians and Surgeons.

[2] The previous reports in this series, by Gies and collaborators, were published in the DENTAL COSMOS: (*1*) 1910, lii, p. 1141; (*2*) 1911, liii, p. 1324; (*3*) 1913, lv, p. 40; (*4*) 1914, lvi, p. 175.

[3] Dunning: DENTAL COSMOS, this issue—see report of *discussion*, page 316 ff.

was suggested that problems pertaining to the saliva were probably the most important. I knew so little of the subject at that time that I readily accepted this opinion and formulated our research plans accordingly. As we proceeded with our work, however, study of the literature and reflection upon experimental facts and biological probabilities led me to suggest informally, before the end of the year (1909), that general nutritional relationships and conditions are probably important factors, directly and indirectly, in resistance and susceptibility to dental caries.

This opinion was almost unanimously opposed, however, by the dentists who were consulted, on the ground that enamel once formed is wholly excluded from nutritional influences and that it can be affected, after its formation, only by external influences, such as those exerted from the oral environment. Although I realized only too well my complete ignorance of dental matters, and that I could not oppose with confidence my mere belief against the opinions of those who were better informed than I was, nevertheless I felt impelled to say, in our *first report* (1910):

> That the *systemic condition* of the individual is an important factor in susceptibility to dental caries is a conviction that we cannot dismiss (p. 283). I presume it would be hard to show that enamel once deposited is modified directly by systemic conditions that prevail afterward, yet more astonishing things than that have been demonstrated. I feel that this possibility should not be dismissed. It should be investigated further (p. 288).[4]

The dissent from my expressed conviction that the internal secretory factors, which are so important in the calcification processes in general, are involved in particular in the development and condition of the teeth, including enamel, reminds me of the discouragement against which McCrudden proceeded when he undertook his important and fruitful studies of bone metabolism. Discussing, recently, the general lack of appreciation of the possibilities in bone metabolism, McCrudden said:

> This subject of bone growth is a very important one, to which very little attention has been given. When we remember that in all the various chronic rheumatisms, osteomalacia, rickets, osteitis deformans, osteoporosis, fractures, dwarfism, and faulty development, bone growth is involved, we see the importance of knowing the normal. And yet almost no one seems to have made an experimental investigation of the question of normal bone growth. Bone is generally considered a dead tissue, not undergoing metabolism once it is laid down. Only Cohnheim and Adami definitely face the question and express the opinion that bone does undergo a continuous process of absorption and resorption, and even with these two pathologists it is merely an opinion and not based on any definite experimental studies. Several years ago, while making chemical studies in various bone diseases, I began to study osteomalacia, and my findings threw some light on this whole question.[5]

Dr. McCrudden was altogether too modest in that concluding sentence—his results have thrown a *flood* of "light on this whole question." That dentin and enamel are similar to osseous tissue, from the standpoint of metabolic changeableness, is a very strong physiological probability.

In several succeeding reports to the New York Institute of Stomatology and the First District Dental Society of the State of New York, we referred, in one way or another, to the conviction that enamel may be subject, destructively at least, to systemic influences, although the reports were devoted primarily to other subjects. Thus, two years ago, (February 1912), again referring to this subject, I said: "The more I reflect on the available facts regarding dental caries, the more I believe in the *possible influences of systemic conditions* as factors in its onset and in its progress."[6]

[4] Lothrop and Gies: *Journal of the Allied Dental Societies*, 1910, v, pp. 283 and 288.

[5] McCrudden: *Transactions of the Fifteenth International Congress on Hygiene and Demography*, 1913, ii, p. 424.

[6] Gies: *Journal of the Allied Dental Societies*, 1912, vii, p. 214.

I then mentioned with intended emphasis, in justification of this old conviction, the interesting observations by Erdheim, on the dental effects of parathyroidectomy (to which we shall refer again today)—observations which had been described in detail a few months before, in one of the German journals of pathology.

In spite of preoccupation with other phases of dental research, under the auspices of your society and of the First District Dental Society of the State of New York, my conviction that general nutritional conditions are important factors in determining the resistance or susceptibility of teeth to caries grew steadily stronger as it fed upon the many pertinent biochemical data in the literature of nutrition, especially of the facts pertaining to the functions of the ductless glands. Accordingly, a year ago (1913) I had the honor here to suggest that you authorize us to undertake, under your auspices, an investigation of dental caries from the nutritional standpoint. With the approval of your Research Committee we have been proceeding, during the past year, with an *introductory chapter,* so to speak, to such research—with a study of the influence of internal secretions on the development and condition of the teeth.

That the members of this society may be inclined to feel skeptical about the desirability or fertility of such investigation is suggested by the following quotation from a paper by Bunting, in a recent issue of the DENTAL COSMOS (March 1913, lvi, p. 286). Speaking with apparent conviction and authority on the present status of knowledge of dental caries, Bunting said:

> It is pretty well considered that although it may be possible for the structure of the tooth to enter into the question to a certain extent, it is not looked upon as being responsible for the sudden and obscure changes in susceptibility, except by those few believers in the mutability of the tooth in response to general physiological change. So that investigation today is being focused upon the environment of the tooth, the saliva, ingested food, etc., seeking in them the changeable element which determines caries.

We happen to be among the "few believers in the mutability of the tooth in response to general physiological change," *i.e.* to systemic nutritional influences, especially destructive ones. We believe, also, that research in this field is as desirable and as fruitful as study in any other in dental science.

Before proceeding with a description and discussion of our experiments, I shall attempt to show you, through the medium of a long but co-ordinated series of quotations from the research literature on internal secretions, that the type of dental investigation we have begun appears to be promising in high degree.

[At this point the speaker quoted extensively from various sections of the research literature on internal secretions, in order to show the probable value of such research, having been under the impression, from the attitude of Bunting and others, that dentists as a body doubted the bearing of this important phase of nutrition on dental physiology and pathology. The discussion of this report (pages 319–328) suggested so strongly, however, that apology for such work in dental biology is unnecessary, that the numerous citations for that purpose (some of which are referred to in the discussion) have been eliminated from this revised report. Since the date of the oral presentation of the original report (May 15, 1914), interesting reviews on this subject have been published in the DENTAL COSMOS by Grieves (August 1914, lvi, p. 954) and Pond (October 1914, lvi, p. 1155.)[7] The gist of much that was stated in our oral report appears in these two valuable reviews.]

As the sub-title of this report indicates, our experiments relate to effects of thyro-parathyroidectomy and thymectomy. The animals selected for the operations were rats, rabbits, and guinea-

[7] The senior author is preparing for presentation in a future report, or in a separate publication, the essentials of the data in the research literature on internal secretions that pertain to the development and condition of the teeth.

pigs. In collateral experiments on 16 puppies we aimed to determine some of the dental effects of artificial acidosis; also of under-nutrition with respect to calcium and phosphorus. The experiments on the dogs were in progress when the oral report was presented. The results in this particular connection will accordingly be considered in the next report.

II. Effects of Thyro-parathyroidectomy.

That the parathyroid glands are intimately involved in the co-ordination of some of the mineral matters in teeth has been indicated by the findings of Erdheim, Toyofuku, Fleischmann, Weichselbaum, Hohlbaum, and others. Results obtained by these investigators suggested that a study of the effects of parathyroidectomy might prove to be the most promising point of departure in our own inquiry.

The leading dental observations, by the investigators named above, were made in experiments on rats. The incisor teeth of rodents in general, by reason of the relatively large size, rapid development, and continuous growth of these teeth, are particularly well adapted to physiological investigation. Rodents grow rapidly to maturity. They breed early, often, and generously. With such animals it is possible to study dental physiology through many generations in a comparatively short time. It is obvious that the younger the animals in such a study at the beginning of an experiment, all other things being equal, the greater the range of opportunity for the observation of effects on the development of the teeth.

Our experiments on thyro-parathyroidectomy were conducted on about 100 albino rats, 20 rabbits, and 15 guinea-pigs, most of which were very young when subjected to operation. Our main attention was given to the rats, the experiments on the rabbits and guinea-pigs having been supplementary.

It had been our original purpose to study the effects of *parathyroid*ectomy, but the successful removal of these tiny glands from young rats was much more difficult than we anticipated. The mere location of these almost imperceptible glandules in young rats is a perplexing matter, and their excision or destruction is attended by unusual surgical difficulty. The most valuable published data on the anatomy of the parathyroid glands in rodents that we have been able to find thus far were those given by Ivanoff[8] relative to a field mouse (*Mus sylvaticus*) and two guinea-pigs. The parathyroids in the former (adult) were 0.3–0.6 millimeter in length, and in the latter they were 0.275 millimeter (young) and 0.63 millimeter (adult) long. The exceptional difficulties in the way of complete excision of organs so minute, or their total destruction by cauterization, induced us to postpone our intended parathyroidectomy operations and to substitute preliminary experiments on *thyro*-parathyroidectomy. We believed, also, that extended experience in this direction would give us special preparation for the more difficult work involving parathyroidectomy.

Our *thyro*-parathyroidectomy operations were conducted under general ether anesthesia and with ordinary aseptic precautions. After making a median skin incision, the muscle exposed over the larynx was divided longitudinally with forceps, the lips of the wound retracted, and the underlying thyroids and accompanying parathyroids carefully freed, with delicate forceps, from their connective tissue attachments. The glands on both sides were then gently pulled out of place with one forceps, while the connecting blood-vessels were compressed and held with another. Hemorrhage under these conditions was usually slight, and could almost always be stopped immediately by pressure with a small wad of absorbent cotton. The skin and muscle were sutured with silk. The wounds, after the insertion of a few stitches, healed promptly in the survivors. The oper-

[8] Ivanoff: Contribution à l'étude des glandules parathyroïdes chez les rongeurs (cobaye et mulot); Thèse, Geneva, 1905.

ation, from the time of initiation of anesthesia to the insertion of the last stitch, was usually completed in 20 minutes, often in 15 minutes, sometimes in less than 15 minutes.

Operations were performed on selected members of groups or litters, some or all of the remaining members of such groups serving as unoperated controls kept under the same dietary conditions and in the same environments.

Both before and after the operations the animals were kept in clean, comfortable, and commodious cages, which were stationed in a working-room in the laboratory where the temperature was moderate, chemical fumes were absent, and the animals could be promptly and repeatedly inspected. The diet was "mixed" in character and abundant in quantity, consisting of cereals, greens, meat, cheese, or bread, or several of these at one time, with water. Control animals grew rapidly and apparently to normal maturity on this diet.

1. *Experiments on Rats.*

Removal of the parathyroids from rats is usually followed promptly by death. A comparatively large number of animals must be subjected to this operation, therefore, in order to obtain a sufficient number of survivors for effective study of post-operative effects on the teeth—a fact involving great regret for those who aim to do such work with the least possible distress to the animals affected.

The following protocol from our notebook, in its original free-and-easy phraseology, illustrates the course of events following *promptly fatal* double thyro-parathyroidectomy in rats:

RAT 55. Young, normal, well nourished, active. Double thyro-parathyroidectomy at 4.25 P.M., April 16, 1914. Weight: 45 grams.

4/16—10.20	P.M.	O. K. up to now. Tremor beginning.
11.00	"	Respiration rapid.
12.00	M.	Ditto. Sitting up, but tends to lean back and topple over.
4/17—12.30	A.M.	Same.
—.50	"	General convulsion.
—.52	"	General prostration at conclusion of convulsion.
—.54	"	Unable to get up, though endeavors to do so.
—.55	"	Hind legs completely paralyzed.
1.00	"	Gradually resumed sitting posture; one hind leg stretched out behind—unable to pull it in and under.
—.05	"	Now on all fours, but wabbling — unable to walk.
—.10	"	Prostrate. Another violent spasm.
—.15	"	Up again. Weak.
—.25	"	Prostrate again—continuous convulsion, very violent.
—.30	"	Prostrate. Breathing very rapidly. Struggles vainly to get up.
—.40	"	Prostrate, with convulsions, since 1.25.
—.45	"	Prostrate since 1.40. Now struggles hard to get up. Finally able to raise only head and tail. Respiration continues rapid.
—.50	"	Same. Marked tremor in fore legs—nowhere else.
—.55	"	Same. Raising head and tail again, apparently in an effort to get up.
2.10	"	Same continuously since 1.55.
—.11	"	Violent convulsive jumps, as if trying to get up and run.
—.12	"	Turns on back. All limbs extended and involved in general convulsion — rapidly intermittent.
—.20	"	Prostrate. Limp. Weak general tremor.
—.21	"	Another strenuous effort to arise, same as at 2.11.
—.22	"	Ditto, several times. Violent tremor in fore legs.
—.50	"	Complete prostration with intermittent convulsions since 2.22.
—.51	"	Died in violent general-extension spasm. Weight: 39.2 grams.

The following protocol from the same note-book illustrates the course of events soon after *non-fatal* double thyro-parathyroidectomy:

RAT 37. Mature, normal, well nourished, active. Double thyro-parathyroidectomy at 3 P.M., April 7, 1914. Weight: 241 grams.

4/8 —	1.30 A.M.	Nothing so far, except labored breathing.
	12.30 P.M.	Ditto, but breathing is less labored.
4/9 —	4.30 "	Respiration more labored again.
	7.15 "	Ditto, increasing.
	10.30 "	Gentle general tremor. Breathing very hard.
4/10—	1.30 A.M.	About same.
	4.00 P.M.	Tremor disappeared slowly during day. Some respiratory distress still evident.
	11.00 "	Gentle general tremor. Breathing continues labored.
4/11—	11.00 "	O. K. all day.
7/11—	10.00 A.M.	Nothing noteworthy since 4/11, except evidence of gradual deterioration of teeth. One lower incisor has been broken off at gum line; the second, broken off half way from gum to tip. Upper incisors abnormally long. Chalky spots here and there on the teeth.
7/18—	6.00 P.M.	Gentle general tremor all day.

[*Sept. 1:* This rat (37) is alive at this date. General tremor was noted again on August 13th, 18th, 24th and 25th. Further reference will be made to this rat in the next report.]

Before the beginning of each experiment, the general condition of the animal, including its teeth, was carefully noted. Observations of this kind were made repeatedly on the survivors, during the progress of each experiment. After the death of an animal, a careful autopsy was made, and the findings noted.

After the conclusion of each autopsy, we took all the teeth and also the femurs and tibias from the animal. The teeth individually were carefully pulled out of place after the grip of the bones and membranes that held them had been broken by suitable paring and excision. Each tooth was cleaned with filter paper. Adherent muscle was cut from the leg bones, which were then gently scraped clean with a scalpel.

After free exposure to the air, for prompt superficial desiccation at room temperature, the teeth and bones were separately crushed and pulverized in a deep porcelain mortar. When, for any reason, we were unable to obtain all the teeth with both the femurs and the tibias from an animal, we used these materials from one side only, and proceeded on a 50 per cent. basis, in this way preventing any analytic irregularities that might have resulted from the use of masses that were not anatomically equivalent in kind and proportion.

After the pulverized material had been uniformly mixed and dried to constant weight at 100° to 110° C., an accurately weighed portion of it (practically all the material in each case) was decomposed in a large Kjeldahl flask, of Jena glass, with a mixture of equal parts of concentrated sulfuric and nitric acids (Neumann's method).[9] The clear, colorless, concentrated acid solution, freed from most of the mechanical excess of residual sulfuric acid, was then diluted to 500 cc., or one liter, and kept in tightly stoppered bottles. Calcium was determined, in duplicate, by McCrudden's method[10] in 100 cc. portions of each solution prepared in this way.

Our analytic data in this connection are summarized in Table 1. Additional data, pertaining to rats that survived after May 15, 1914 (the date of this report), will be given in our next communication.

The analytic data in Table 1 suggest the chemical conclusions, on the effects

[9] Thierfelder: Hoppe-Seyler's Handbuch der chemischen Analyse, 8th ed., Berlin, 1909, p. 539.

[10] McCrudden: *Journal of Biological Chemistry*, 1911, x, p. 187. Neuberg: Der Harn, sowie die übrigen Ausscheidungen und Körperflüssigkeiten, Berlin, 1911, i, p. 168.

TABLE 1.

DATA PERTAINING TO ALBINO RATS SUBJECTED TO THYRO-PARATHYROIDECTOMY, WITH CORRESPONDING "CONTROL" DATA.[1]

Rat. No.[2]	Control (C), or operated (O).	Weight.[3] Beginning. Grams.	Weight.[3] End. Grams.	Period of survival: Days.[4]	Percentage of calcium, as Ca (*not* CaO). Teeth.	Percentage of calcium, as Ca (*not* CaO). Bones.[5]	Remarks on symptoms, condition, cause of death, etc.[6]
I. 7	O	85	. .	19	27.71	. . .	No tremor or convulsions observed.
8	O	106	126	57	26.83	24.30	Etherized.[7] No observed effects of surgical operation.
10	C	121	137	57	28.02	24.97	Etherized.
II. 13	O	45	36	63	28.08	16.15	Partial paralysis of legs and occasional convulsions. Bones "soft."
15	C	44	72	64	27.90	17.60	Etherized.
III. 26	O	32	25	22	24.71	16.23	Severe tetany and paralysis.[8] Bones "soft."
29	O	44	40	12	28.08	. . .	Severe tetany.
30	O	34	. .	5	24.06	. . .	Severe tetany occasionally.
34	C	56	76	22	26.72	20.60	Etherized.
36	O	89	. .	2	27.05	20.61	Severe tetany. One violent convulsion.
IV. 38	O	240	208	2	27.33	. . .	General tremor. Convulsive jerks.
40	O	127	102	27	27.35	23.78	Slight tremor occasionally.
42	O	229	200	28	28.34	25.41	No symptoms.
44	O	131	72	11	28.38	25.28	Severe tetany.
45	C	122	101	12	27.73	24.55	Etherized. Open tumor on right hind leg.

V.	50[9]	O	50	47	1	22.31	17.91	Violent convulsions. Dead in seven hours.
	51	O	58	37	17	27.49	21.08	Severe tetany with marked paralytic effects.
	52	C	44	30	14	26.67	. . .	Natural death.

[1] Additional data pertaining to these rats, such as the condition of the teeth, will be given in the next annual report, with the results of work that could not be completed before the date of the meeting at which these experiments were described. (At autopsy it was found that all the thyroidal and parathyroidal tissues at the laryngeal sites of these glands had been extirpated or practically so. The possible occurrence and functionation of accessory parathyroid tissue was considered but not investigated. In the proposed histological extension of our work, this phase of the subject will receive experimental attention.)

[2] The missing numerals (to 100) pertain to rats that died within twenty-four hours after operation, or survived after the date of the meeting at which this report was presented. It was assumed for some time that rats which succumbed within twenty-four hours after the operation died before any appreciable chemical changes could occur in the teeth. The data for rat 50 suggest that possibly this assumption was unwarranted. (See table footnote 9.) Further attention will be paid to this particular point.

[3] Blanks in the series of data for body weights are due to oversights. "Nearest" whole numbers for body weight are recorded.

[4] In the case of the "control" animals, the numerals in this column indicate numbers of days from the day of operation on the first animal of the group to the day when the "control" animal was put to death by ether anesthesia. "Nearest" whole numbers for these days are recorded.

[5] Blanks in this column indicate either that the values will not be available or will be supplied with the supplementary data in the next annual report.

[6] Only the most significant facts are suggested in the "remarks." The details will be amplified in the next report.

[7] "Etherized" is used conveniently for the phrase "killed with ether by inhalation."

[8] Unless otherwise qualified, the designation in this column of a symptom implies its frequent or prolonged occurrence.

[9] This rat (50) was originally a "control," but as 52 appeared to be a normal survivor in this group, and most of its operated associates succumbed, we changed rat 50 to the "operated" subdivision. During the week prior to the day of operation, the weight of this rat increased 2 grams.

Summary.

I—A. Lower degree of calcification of both teeth and bones:
  a. Rat 8 compared with rat 10—1.19% and 0.67% respectively.
  b. " 26 " " " 34—2.01% " 4.37% "
  c. " 40 " " " 45—0.38% " 0.77% "

B. Lower degree of calcification of teeth (no comparable data on bones).
  a. Rat 7 compared with rat 10—0.31%.
  b. " 30 " " " 34—2.66%.
  c. " 38 " " " 45—0.40%.
  d. " 50 " " " 52—4.36%.

C. Lower degree of calcification of bones, but not of teeth.
  a. Rat 13 compared with rat 15—1.45%.

II—D. Greater degree of calcification of both teeth and bones.
  a. Rat 42 compared with rat 45—0.61% and 0.86% respectively.
  b. " 44 " " " 45—0.65% " 0.73% "

E. Greater degree of calcification of teeth, but lower degree of calcification of bones:
  a. Rat 13 compared with rat 15—0.18%. (This difference is too slight for any emphasis, however.) (See I, C.)

F. Greater degree of calcification of teeth (no comparable data on bones).
  a. Rat 29 compared with rat 34—1.36%.
  b. Rat 51 " " " 52—0.82%.

G. Greater degree of calcification of teeth, but no effect on bones.
  a. Rat 36 compared with rat 34—0.33%.

of our double thyro-parathyroidectomies, that are indicated by the above summary, from which we see at a glance that the teeth of *seven* operated rats contained less calcium than the teeth of the corresponding control rats; but the teeth of *six* operated rats contained more calcium than the teeth of the corresponding control rats. The average difference for the former was −1.62%; for the latter, +0.66%.

The bones of *four* operated rats contained less calcium than the bones of the corresponding control rats; but the bones of *two* operated rats contained more calcium than the bones of the corresponding control rats. The average difference for the former was −1.82%; for the latter, +0.80%.

Further summarization of the above average percentage data shows these differences more conveniently below:

The *general average* data for percentage calcium contents in the teeth and bones are the following:

	Teeth.	Bones.
Control rats	27.41%	21.93%
Operated rats	26.75%	21.19%
Difference	0.66%	0.74%

If we were seeking to verify, from the biochemical standpoint, the results obtained by Erdheim and others from the histological point of view, we might be expected to assume, with bias in that direction, that these percentage differences support Erdheim's conclusions. But we have attempted neither to verify Erdheim's findings nor to prove them incorrect—we have sought simply the facts in the case. Our data require, we think, the frank conclusion: *Nothing proved one way or the other!* With such openmindedness we shall extend

Operated Rats compared with Control Rats.

Degree of calcification.	Teeth.		Bones.	
	No.	Percentage of Ca (av. difference).	No.	Percentage of Ca (av. difference).
Lower degree of calcification	7	−1.62	4	−1.82
Greater degree of calcification	6	+0.66	2	+0.80

these particular experiments and report further, a year hence, the data that additional experience and further work may afford.

The nature of the foregoing general inference, and the purpose based thereon, make it useless to discuss the chemical data in Table 1. But before proceeding with the rest of our report, we wish to allude to the fact that our control animals were not as numerous as our cumulative experience has shown they should have been, so far as determinations of calcium content in teeth and bones are concerned. The loss of weight in two of the control rats (45 and 52) suggests that, in spite of the abundance of food available to them, they were poorly nourished for one reason or another, and probably, therefore, were not suitable "control" animals. The tumor in rat 45 (which had not been observed when the animal was selected), and the disease that caused the premature death of rat 52, may explain the obvious malnutrition in each. These disorders emphasize, nevertheless, the possible unreliability of these rats for "control" purposes in our calcium work.

The loss of weight in practically all the operated animals is a matter that requires, and will receive, special attention in our future experiments in this particular connection, involving, as it may, tissue deficiency in calcium (and other constituents) *from loss of appetite,* with consequent diminished consumption and absorption of food (calcium), rather than from inability to assimilate, into the bones and teeth, the calcium that may be available in the alimentary tract and in the blood. Such animals, both operated and control, should evidently be studied from quantitative nutritional standpoints with foods *known* to be particularly rich in *assimilable* calcium and also with diets very deficient in such calcium. The animals received a diet that is ordinarily very nourishing, and we relied in a general way on a normal outcome in this respect. Our results require the skepticism on this point, however, that we are indicating.

We are also doubtful, *now,* of the adequacy of our chemical procedure. We took *all* the teeth in each instance. Probably the incisor teeth alone would show results more strikingly. We used *whole teeth* and *whole bones,* after pulverization and *desiccation* to constant weight; but differences in the composition of dental pulp and bone marrow may have influenced irregularly our percentage data for calcium. A "water-free basis" may not be uniform enough to show certain comparative differences in calcification. Probably preliminary removal of substances soluble in water or in ether, or in both, would afford more definite and uniform bases for estimations of comparative degrees of calcification. We may find it necessary to rely solely, in this connection, on analyses of *ash* from the teeth and bones.

It is probable, also, that careful note must be made of sex differences, and that "control" rats must be of the same sex as those with which they are experimentally compared. Close relationship in a given litter, freedom from disease, identical states of nutrition, equal weights, similarity in activity, and close general resemblances are important experimental considerations, but not sufficiently inclusive. "*Segregation* of the sexes" may likewise be required in all such experiments, especially in view of the probable interference with calcification of the teeth in growing pregnant animals.

These considerations, and others of equal importance, might now be ignored, as they were by us at the beginning, if our results had been striking enough to warrant the belief that biochemical differences due to thyro-parathyroidectomy "covered" the differences due (probably) to such physiological variations and disparities as are suggested above. But it is plain that the biochemical variables to which we have just referred, and others like them, must be *experimentally* considered in detail, and controlled before further progress in exact knowledge can be made in studies of this kind. All our doubts in these and similar relations will be resolved, we

hope, by the chemical and histological experiments now in progress with that end in view.

We have not overlooked the possible counteracting influence of thyroidectomy when it accompanies parathyroidectomy. This phase of the matter will also be given due attention at an early date. Our views on this phase of the subject were intimated in one of the opening paragraphs of this section of our report.

[Certain additional facts bearing on reasons for uncertainty regarding interpretation of the data pertaining to these experiments on rats are mentioned on page 294.]

2. Experiments on Rabbits and Guinea-pigs.

Our data for rabbits and guinea-pigs add nothing of significance to the results for the rats. Accordingly, our results for these animals will be withheld for communication with the findings in additional experiments on such animals.

III. Effects of Thymectomy.

During the progress of our experiments on the effects of thyro-parathyroidectomy, we learned that Dr. Alwin M. Pappenheimer, associate in pathology at the Columbia Medical School, was studying, in the pathological laboratory, the effects of thymectomy on bones and teeth in albino rats. He was engaged in this work with special reference to the validity of the positive conclusions in this connection that were recently published by Klose—conclusions which were at variance with negative deductions previously stated on this subject by Dr. Pappenheimer. It was our good fortune to be able to co-operate with Dr. Pappenheimer in this work, from the standpoint of chemical analysis of some of the bones and teeth of a number of his most valuable rats; and to profit greatly, besides, in all our work on internal secretions in their relation to ossification and dentition, from association with Dr. Pappenheimer in this particular research, which he inaugurated independently.

[Most of the analytic figures in Table 2, and the collateral data, were available last May, and were stated in our oral report. The recent publication by Dr. Pappenheimer,[11] and by the senior author in association with Dr. Morgulis,[12] of the details of this work on thymectomy, enables us to add to this revised report much that was learned in this relation since last May, and which was detailed in the two papers mentioned above. Accordingly, with Dr. Pappenheimer's consent, we make free use, below, of the phraseology of sections of the papers by him, and by Morgulis and Gies. We are greatly indebted to Dr. Simon Flexner, editor of the *Journal of Experimental Medicine,* for permission to use the accompanying plates, which were originally published in that journal as a part of Dr. Pappenheimer's paper.]

Dr. Pappenheimer introduced his paper with the following comment:

> In a previous paper[13] dealing with the effects of extirpation of the thymus of white rats, the writer reached the conclusion that total removal of the gland at an early age was not necessarily followed by modifications of the normal development, nor by characteristic changes in the skeletal system.
>
> While that article was in press, there appeared a short paper by Klose embodying results at variance with these observations. Klose described briefly the results of thymus extirpations in pigs, goats, rats, and chickens. The rats were operated upon on the fourteenth day after birth. Some of the animals showed no results from the operation, and this failure is ascribed by Klose to the presence of accessory tissue within the thyroid gland. In rats without such accessory thymus tissue, death followed after eight to ten weeks, with symptoms of cachexia thymopriva. The bones in these rats showed severe rhachitic changes. Most striking were the changes in the ribs, in which there was found

[11] Pappenheimer: *Journ. of Exper. Medicine*, 1914, xx, p. 477 (November).

[12] Morgulis and Gies: *Ibid.*, p. 499 (November).

[13] Pappenheimer: *Ibid.*, 1914, xix, p. 319 (April).

a typical rosary, such as is seen in human rickets. Microscopically there was an extreme widening of the zone of growing cartilage, failure of calcification in the preparatory zone, great irregularity and distortion of the cartilage columns, and their penetration by bloodvessels. Klose pictures further a dense spongiosa composed in the region of the costochondral junction almost wholly of osteoid, and an accompanying transformation of the marrow into "Fasermark." Similar but less striking changes were found also in the femora.

These conflicting observations induced Dr. Pappenheimer to present the additional data in his second paper on this subject.

It has been suggested [he wrote] that[14] negative results might be due to unrecognized lobules of accessory thymic tissue which had undergone delymphoidization or other involutional change, making their identification difficult. While it is hard to refute this criticism absolutely, it may be said that in those cases in which accessory tissue has been present, there has been no difficulty in recognizing it as such and in differentiating it from lymphoid tissue. Further, the failure of such minute thymic rests to undergo hyperplasia, in itself suggests that they are of no great functional significance.

Dr. Pappenheimer's operative technique, as "fully described in the previous study," was conducted as follows:

The removal of the thymus was performed upon young rats, ranging in weight from 10–25 grams. When possible the age was accurately determined, but in some litters it had to be estimated. Probably none of the operated animals were over twenty-one days old when the gland was removed. Two or more rats from each litter were reserved as controls, and kept in the same cage as the operated rats.

The operation was performed aseptically under ether anesthesia. A median incision was made in the lower part of the neck and continued over the upper half of the thorax. The sternum was then split as nearly as possible in the median line as far as the fourth or fifth intercostal space, and the edges were retracted. The triangularis sterni muscle was separated, exposing the thymus, which was carefully dislodged from below upward with fine blunt forceps, and removed, when possible, without laceration or separation of the two lobes. The friability of the gland made this the most difficult part of the operation. The sternum and skin were sutured with silk. Healing in almost all cases took place rapidly and without suppuration. It was found advantageous to use a simple positive pressure apparatus, to prevent collapse of the lung when the pleura was accidentally injured, and to institute artificial respiration when necessary.

In the earlier experiments the control rats were also subjected to etherization and the sternum was incised without removal of the thymus. It was found later that the operation had practically no immediate effects, and this precaution was therefore considered unnecessary.

After the end of the nursing period, the rats were fed principally on bread, sunflower seed, and greens. Meat was not given, and the feeding of milk was given up, since it seemed to favor the spread of infection. The operated rats together with the controls were kept under observation for varying periods up to six months, and were then killed. They were weighed weekly.

At autopsy the organs of the neck and thorax were removed together. After fixation the lungs and lower half of the heart were dissected off, and the rest of the tissue was embedded in paraffin and cut in series of 10 micra in thickness. In the earlier litters each section was mounted, but later only every tenth section was examined.

The completeness of the operation and the possible presence of accessory thymic tissue in the thymectomized rats was controlled in each case by an examination of serial sections of the entire neck organs, including the thyroid, and the upper half of the thoracic organs. The teeth and bones were decalcified in 5 per cent. nitric acid. The staining methods included Morpurgo's modification of Schmorl's thionin-picric acid method, which differentiates even in completely decalcified specimens between osteoid and completely calcified bone.

The following abbreviated protocols and comment are quoted from Dr. Pappenheimer's last paper (page 479 *et seq.*):

1. *Animals in which complete thymectomy was not followed by alterations in growth, nutrition, or skeletal system.*

Litter U. This litter consisted of seven rats, four of which were thymectomized on

[14] Personal communication from Prof. J. Salkind.

July 28, 1913. During the following weeks mother and young received protective inoculations of a *B. enteritidis* vaccine, since fatal infections with this organism were prevalent at that time.

Rats U_1, U_3, U_5 and U_6 (see Table 2) were kept under observation until January 28 and 29, 1914, when they were killed with ether. The bones and teeth were reserved for chemical examination and were not studied histologically. There were no gross changes. (See Table 2, page 292.)

Litter O. This litter consisted of six rats, upon four of which thymectomy was performed on July 17, 1913. During the following weeks all the animals received prophylactic injections of a vaccine of *B. enteritidis*. With the exception of one rat, O_4, which developed bloody diarrhea and died after four weeks, all the rats of this litter gained steadily in weight and remained healthy. Rats O_1, O_2, and one of the controls, O_5, were killed on Nov. 15, 1913, 120 days after the operation. Rat O_3 and the remaining control, O_6, were killed eleven days later. In none of the operated rats were there found rests of thymic tissue or accessory glands. *A careful microscopic examination of the bones and teeth showed no abnormal conditions.* The *calcification of the dentin of the incisors* is shown *for comparison with that in rhachitic rats*, in Figs. 1a and 1b, Plate 1, page 298.

2. Litters in which both operated animals and controls showed lesions of the teeth and bones.

Litter X. This litter consisted of six rats, four of which were operated on Oct. 24, 1913, the remaining two being kept as controls. The estimated age at the time of operation was sixteen days. Data pertaining to four of these rats follow:

Rat X_2. On Nov. 12th a small fragment of thymus from rat X_6 was implanted beneath the skin of the abdominal wall. The small nodule disappeared after a few days, and no remains of it were found at autopsy. There were no convulsive symptoms or other evidence of illness following the implantation. The rat remained well, but was behind the remaining animals of the litter in size and weight. It was allowed to live 151 days after thymectomy, and was then killed together with control rat X_5.

Autopsy: Poorly nourished, eyegrounds pale, slight exophthalmos. Internal organs normal. In the thymic region there were five or six lymph nodes and fat; no gross remains of thymus.

The *ribs* show fairly marked deformity. The zone of growing cartilage is broad and translucent, and there is distinct nodular swelling at the junction of cartilage and bone. There are also several opaque, fusiform, whitish swellings along the shafts of the ribs. The *femur* is 5 mm. shorter than that of X_5, the control, and thicker, but not noticeably deformed. *The teeth show no gross changes, aside from a notching of the cutting surface of the upper incisors.*

Microscopic examination: In the *ribs* the zone of proliferating cartilage cells is about 0.4 mm. in width (normal width about 0.1 mm.). By actual measurement with the projection apparatus, it is found to be about six times as broad as that of a normal control. It is composed of fourteen to sixteen swollen cells. The margin is uneven and irregular columns and groups of cartilage cells in which the ground substance stains like osteoid are found amongst the trabeculæ of the spongiosa. These are wide, irregular in their arrangement, and composed in the neighborhood of the epiphysis almost wholly of a homogeneous osteoid. Only the central portions take a bluish stain and show typical bone structure. The marrow spaces are narrow, and the marrow is fibrous. The osteoblasts are very high and conspicuous. The cortex is broad, and the marrow cavity of the shaft correspondingly reduced. The nodular swellings seen in the gross correspond to localized thickenings of the compact bone. The epiphyseal cartilage of the femur is very convoluted, and there are masses of swollen cells projecting among the trabeculæ of the spongiosa. The width of the proliferating zone varies. It is from six to twelve cells deep. The spongy bone is dense, the marrow spaces reduced in width.

The *incisor teeth* show pronounced changes in the calcification of the dentin, both in the upper and lower incisors. The essential feature is a defective and irregular calcification, with ingrowth of bloodvessels into the calcium-free dentin. On the concave side of the upper incisor there are alternating striæ of calcified and calcium-free dentin. No lesions are found in the enamel epithelium. The *changes in the teeth* are illustrated in Figs. 2a, 2b, 2c, and 2d, Plate 1.

Rat X_5. Control, male. Killed with ether at the same time as X_2.

Autopsy: Well nourished, apparently healthy rat. No gross lesions of internal organs, ribs, femora, or teeth. Testes small, undescended.

Microscopic examination: Two *ribs* were examined. One shows much more pronounced changes than the other. The lesions in the more severely affected rib are identical with those described in the rib of X_2. The width of the growing cartilage is increased, and the disarrangement of the cartilage cells is extreme. There is an excessive amount of spongy bone in the region of the epiphysis, the trabeculæ having a wide osteoid margin. The marrow is fibrous in character. The *femur* also shows similar changes.

The *incisors* show a marked defect in the calcification of the dentin, with ingrowth of cells and bloodvessels from the odontoblast layer, as shown in Figs. 3a, 3b, 3c, and 3d, Plate 2. The enamel epithelium of the upper incisors is interrupted at one point and folded in upon itself. The enamel in this region has fallen out.

The remaining rats of the litter, X_3 and X_4, and the control, X_6, were killed 156 days after the operation.

Rat X_3. Large, well-nourished male. Nothing abnormal noted in viscera, bones, or teeth. Many large lymph nodes in substernal region, but no gross remains of thymus.

Microscopic examination: In the *upper incisors* the calcification of the dentin is *practically complete* on the convex surface throughout the whole length. Near the base of the tooth the border of the calcified portion is slightly wavy, and there are a few ingrowing bloodvessels. The concave edge also shows good calcification of the dentin, although in the middle portion there are a few calcium-free streaks, and in places the calcium is deposited in globular form. The odontoblast layer is well formed through the entire extent of the pulp cavity on both sides. The enamel is wanting in the sections, but the ameloblasts are normal.

Normal chondrocostal junctions in several *ribs* examined. There are four to eight growing cartilage cells, regularly disposed. The osteoblasts are well formed. There is no excess of osteoid tissue.

Rat X_4. Thymectomy.

Autopsy: Fairly well-nourished female. No changes in internal viscera. No macroscopic remains of thymus. Definite lesions are seen in the *ribs*, similar to those described in X_2. The chondrocostal junctions are swollen, and there is sharp angulation of the lower ribs. The zone of growing cartilage is broad, and the adjacent part of the shaft for a distance of about 2 mm. is grayish white and soft. Four of the ribs show on the pleural surface, about 1 cm. from the junction with the cartilage, pearly, cartilaginous swellings. *Teeth and femora show no gross changes.*

Microscopic examination: The upper *incisors* show changes similar to those described in rats X_2 and X_5, but somewhat less marked. The defective calcification of the dentin, on the convex surface, near the base of the tooth, is marked, about one-third of the entire width being entirely calcium-free. In the middle portion, about two-fifths of the dentin is uncalcified. Here, and also towards the tip, the calcium is deposited in laminæ. There is an abundant ingrowth of capillaries from the odontoblast layer. On the concave side, near the base, half the dentin is calcium-free. Toward the middle and distal portion the calcification is still more incomplete, and in the form of alternating calcium-free and calcium-containing layers. The lower incisors show similar changes, especially marked on the concave surface.

The growing cartilage of the *ribs* presents an even convex surface towards the shaft. The rows of cartilage cells are six to ten cells deep. The spongiosa is composed of very broad trabeculæ with wide osteoid zones, and high osteoblasts. The pearly swellings observed in the gross correspond to localized thickenings of the compact bone.

The zone of growing cartilage of the *femur* at the lower epiphysis is convoluted and slightly increased in breadth, but not markedly irregular. The spongiosa is formed of coarse trabeculæ with a relatively broad osteoid zone and distinct osteoblasts.

Rat X_6. Control.

Autopsy: Large, well-nourished rat, showing no changes in the internal organs. There is slight beading of the ribs, with a broad grayish zone adjacent to the cartilage. The femora and teeth appear normal.

Microscopic examination: In the upper *incisors* the odontoblasts are well formed, extending through the entire length of the pulp. Calcification of the dentin is not abnormal, save that the odontoblast layer is rather wavy. The uncalcified predentin is narrow.

Ribs and femur show nothing abnormal.

Litter Y. This litter, consisting originally of eleven rats, was born in the laboratory of stock animals, all the rats previously studied having been obtained from Granby, Mass. The rats were undersized, and stood the operation poorly, only three thymectomized and three controls surviving.

Rat Y_2. Thymectomized Oct. 27, 1913. Weight 10 gm. Gained slowly and remained

undersized. Killed on Mar. 13, 1914, 137 days after extirpation of the thymus.

Autopsy: Internal organs normal save for suppurative foci in the lower lobe of the right lung. Testes large and descended. No alterations of the bones and teeth were recorded.

Microscopic examination: The line of growing cartilage of the *ribs* is broad, with a convex, irregular surface directed towards the shaft. It is composed of eighteen to twenty cells in rows, with masses of cartilage cells projecting amongst the trabeculæ of the spongiosa. These are numerous, broad, with a wide osteoid margin, and high conspicuous osteoblasts. The marrow spaces in the region of the cartilage are narrow, the vessels hyperemic and surrounded by spindle cells.

Upper epiphysis of *tibia:* No definite rhachitic changes. The zone of growing cartilage is slightly narrower than that of the control. The cells are regular in their arrangement, as are the trabeculæ. Bone formation is very active. The osteoid zone about the trabeculæ is slightly increased in width. This is especially clear in the epiphyseal center of ossification.

The epiphyseal line of the *femur* is regular on the whole, but there are a few projections of cartilage amongst the trabeculæ of the spongiosa. The osteoid is increased in amount.

The calcification of the dentin of both upper and lower *incisors* is somewhat defective, but there is no vascularization of the calcium-free dentin. The enamel epithelium is not altered.

Much more striking were the skeletal and dental changes in rat Y_8, the protocol of which follows.

Rat Y_8. Thymectomy on Nov. 1, 1913. Weight at operation 14.6 gm. Following the operation, and until the rat was killed on Mar. 2d, 126 days after extirpation of the thymus, it lagged far behind the remaining rats of the litter in weight and size. The hair was rough and sparse; the head seemed relatively large as compared with the body. On Jan. 17th it was noted that the upper *incisors* were very long and thick as compared with the lower, which were small and delicate. On Feb. 28th the right upper incisor was broken off just beyond its emergence from the gum.

Autopsy: Poorly nourished, stunted male. Weight 42 gm. The internal viscera were normal, with the exception of the right lung, which was atelectatic in its upper portion. No gross remains of thymus. The thorax is greatly deformed by the presence of a deep groove along the line of the chondrocostal junctions. From the pleural surface there are seen, especially on the lower ribs, nodular protuberances at corresponding points. There is thus a pronounced rhachitic rosary. The bones of the lower extremities are softer and more pliable than normal, and there is distinct swelling about the epiphyses of the knee-joints.

Cultures from the heart blood and spleen on slant agar remained sterile.

Microscopical examination: The upper *incisors* were sectioned through the fractured stump. The pulp is hyperemic and largely necrotic. The calcification of the dentin is both irregular and incomplete. The line of junction between odontoblasts and predentin is sinuous, and in many places the odontoblast cells penetrate the uncalcified tissue. The calcified portion of the dentin is laminated, the calcium being in the form of coarse globules. In another section there are alternating zones of calcified and calcium-free dentin. Isolated cells and occasionally capillary loops reach the outer, imperfectly calcified zone. Sections through the unfractured upper incisor show also defective calcification. Near the root, there is the same stratification as in the fractured tooth. In the middle portion, just after it emerges from the socket, the section passes outside the pulp canal. In this region there is a large area of calcium-free dentin. Near the convex surface, within the calcified strata, there are a number of globular yellowish masses. In sections stained with thionin-picric acid, it is seen that the dentin filaments are interrupted at the site of these globular deposits. Near the root, the congested pulp vessels penetrate the uncalcified dentin as papillary ingrowths. About one-half of the dentin on the convex surface of the lower incisors is free from calcium. The odontoblasts are poorly formed and irregular. There is no marked ingrowth of bloodvessels. On the concave side the calcification is still more imperfect.

The zone of growing cartilage of the *humerus* at the lower epiphysis is widened, and irregularly prolonged amongst the trabeculæ. These are very broad and the marrow spaces correspondingly narrow. The trabeculæ are composed in the neighborhood of the epiphysis of a narrow, ossified central portion, distinctly laminated, with angular bone corpuscles, surrounded by a very broad homogeneous, osteoid zone in which the nuclei of the bone corpuscles are larger and more rounded, and quite irregularly distributed. The osteoblasts are conspicuous and well formed. There is no increased osteoclastic resorption. The changes at the lower epiph-

ysis of the *femur* are similar in character, but more pronounced than in the humerus. Numerous sections from four different *ribs* show similar changes. There is marked deformity at the junction of cartilage and bone, where the rib measures 3 mm. in diameter. The junction of the cartilage with the shaft is in most places sharply marked off. There is a large central mass of hypertrophic cartilage, in some places twenty-five cells deep, and two shorter lateral spurs. Near the pleural surface, smaller irregular groups of cartilage cells are surrounded by osteoid-staining matrix. The adjacent cancellous bone is composed of stout trabeculæ formed entirely of pink-staining osteoid, separated by very narrow clefts and spaces. They are ranged, in the region where the rib is sharply angulated, at right angles to the cartilage columns. The distribution of the bone corpuscles through this mass of osteoid is haphazard. Farther along the shaft, the trabeculæ of the spongy bone follow the long axis of the rib. They are all greatly thickened, as is the corticalis, and well calcified only in their central portions. In thionin-picric acid-phosphotungstic acid-stained preparations, the broad osteoid, blue-staining zone appears with great distinctness. The marrow cavity is much reduced in width. Near the epiphysis the marrow is fibrous; farther along it has the normal lymphoid appearance.

Two control rats of the litter, Y_7 and Y_9, showed alterations in the teeth and bones comparable with those observed in the thymectomized rats, though somewhat less pronounced. A third control, Y_{10}, which had complete visceral transposition, was not histologically examined.

Rat Y_7. Control. Killed Apr. 7, 1914. Poorly nourished female, weighing 115 gm. Internal organs show no lesions, with the exception of the lung. The right middle lobe in converted into a mass of cheesy abscesses, separated by scar tissue. The *ribs* show slight beading at the chondrocostal junctions, with angular deformity in the region of the diaphragmatic attachment. The zone of growing cartilage is broad. No gross changes in *femora* or *teeth*.

Microscopic examination: In the upper *incisors* calcification of the dentin is imperfect, both on the convex and on the concave surfaces. The odontoblast layer is broad, but ill defined, and on the concave side cells are seen to penetrate the calcium-free dentin for varying distances. Both surfaces of the lower incisors show alternating layers of calcium-containing and calcium-free dentin. The calcium is deposited in the form of coarse globules.

The growing cartilage of the *femur* is narrow, being composed of only two to four rows of cells in the lower epiphysis. Both in the compact and in the spongy bone, the osteoid margin is very broad and distinct, especially about the perforating vessels. The *ribs* show no deformity in the sections examined, but there is a distinct increase in the width of the osteoid zone about the trabeculæ.

Rat Y_9. Control, male. Killed Mar. 13, 1914. Weight 118 gm. There were no lesions of the internal viscera. The alterations of the *teeth* were insignificant (slight lamination of the calcium on the convex surface of the lower incisors), but there was distinct irregularity and thickening of the cartilage at the lower epiphysis of the *femur* and at the upper epiphysis of the *tibia*. The single *rib* examined was practically normal.

3. Unoperated animals, from "stock" cages, that showed lesions of the teeth and bones identical with those in group 2.

To the foregoing protocols of thymectomized and control rats may be added the brief description of two unoperated rats taken from the stock cages, which showed lesions in the bones and teeth identical with those described above:

The first of these (rat 50) was greatly stunted; there was a marked disproportion between the size of the head and that of the body. The approximate weight was 50 gm. The hair was rough and sparse. The *teeth* were somewhat chalky, but not greatly altered. There was an extreme deformity of the *thorax*, resembling that noted in rat Y_2. There was also marked kyphosis and lateral curvature. There were many whitish nodules along the shafts of the *ribs*, especially in the paravertebral lines. The ribs were very soft, and on cross-section the marrow cavity seemed almost obliterated owing to the great thickening of the cortex of the bone. At the chondrocostal junctions were nodular projections several millimeters in thickness. The *femora* were short, and very broad in the region of the epiphyses. The upper third of the *tibiæ* was bowed anteriorly.

Microscopic examination: The superficial layer of dentin of the upper *incisors* is well calcified; in the middle zone, the calcium is in the form of globular masses of large size, and the inner zone, comprising about one-third of the total thickness of the dentin, is calcium-free. Toward the apex the calcification is more complete. The lower incisors exhibit more striking changes, especially on the concave surface, where about half the dentin is free from calcium. The vessels of the pulp are extremely congested, and the

TABLE 2.

DATA PERTAINING TO ALBINO RATS SUBJECTED TO THYMECTOMY, WITH CORRESPONDING "CONTROL" DATA.[1]

Rat.[3]	Thymectomy.	Duration of experiment.	Weight at death.	Rhachitic lesions.		Percentage data.[2]						Remarks.
						Calcium.		Magnesium.[4]		Phosphorus.[4]		
		Days.	Grams.	Teeth.	Bones.	Teeth.	Bones.	Teeth.	Bones.	Teeth.	Bones.	
U_1	Complete	185	97	None	None	27.48	22.61	1.51	0.60	15.28	10.90	No histological examination of bones or teeth.
U_3	"	186	111	"	"	28.97	24.01	. .	. .	. . .	. . .	Ditto.
U_5	Control	186	116	"	"	27.93	23.16	. .	. .	. . .	. . .	Ditto.
U_6	"	185	152	"	"	28.29	22.74	1.91	0.52	15.80	12.45	
X_3	Incomplete	156	196	Slight	"	26.51	21.37	. .	. .	. . .	. . .	
X_4	Complete	156	110	"	Moderate	28.61	20.89	. .	. .	. . .	. . .	
X_5	Control	151	143	Marked	Marked	. . .	18.92	. .	1.35	. . .	11.87	Minute thymus, IV.
X_6	"	156	180	Slight	None	28.12	22.84	. .	. .	. . .	. . .	
Y_2	Complete	150	85	Moderate	Marked	28.53	17.85	3.48	0.92	19.78	9.63	
Y_7	Control	168	115	"	Moderate	27.09	23.14	. .	. .	. . .	. . .	
Y_9	"	150	119	"	"	27.23	18.68	. .	. .	. . .	. . .	
W_2	Complete(?)	192	240	None	None	28.31	24.40	. .	. .	. . .	. . .	Series of neck organs incomplete.
W_4	Control	192	240	"	"	28.99	23.75	1.54	0.53	17.12	. . .	
Z_1	Incomplete	166	145	Very slight	"	28.43	22.29	. .	. .	. . .	. . .	
Z_4	Control	166	123	None	"	27.84	23.13	. .	. .	. . .	. . .	

50[5]	Stock	. .	. .	Slight	Marked	26.44	23.41	. .	2.62	. . .	13.88	Inoculated with bone marrow from spontaneously rhachitic rat.
535	"	. .	90	Marked	Moderate	. . .	18.15	2.79	. .	. . .	. . .	Spontaneous rhachitis.
555	"	. .	75	"	"	25.49	20.66	. .	1.34	. . .	9.30	Inoculated with bone marrow from spontaneously rhachitic rat.

[1] This table is taken, in the main, from the paper by Morgulis and Gies. The data for magnesium and phosphorus have been added since the publication of that paper.

[2] The percentage data pertain to the elements, not to oxids, and relate to substance dried to constant weight ("water-free").

[3] The rats of the W and Z litters were not mentioned in the protocols.

[4] The lack of available material prevented more numerous determinations of magnesium and phosphorus.

[5] These numerals, though they duplicate the corresponding numbers for the thyro-parathyroidectomy experiments, are independent of the latter.

odontoblast layer is broken up in many places by fresh capillary hemorrhages. Toward the apex of the tooth, the layer of odontoblasts becomes entirely disorganized, with the formation of numerous ragged cavities, possibly the effect of gas formed during decalcification. The enamel epithelium is intact save in one place, where the cells are destroyed by hemorrhage.

The zone of proliferating cartilage of the *ribs* is composed of irregular masses of cells which fail to show the normal alinement into columns, and which extend a variable distance into the adjacent trabeculæ. The neighboring part of the rib is composed of a knob of anastomosing columns separated by very narrow Haversian spaces. The distinction between osteoid and calcified bone is not sharply brought out in the sections, but the rounded form of the bone corpuscles and their highly irregular distribution suggest deficient calcification. The osteoblasts form a continuous flat row covering the trabeculæ. There is no increased lacunar resorption. Beyond this knob of tissue the bone is sharply bent upon itself. A tongue of cartilage grows into this angle from the external surface of the periosteum. The cortex of the rib is greatly thickened and formed of parallel trabeculæ which encroach upon the medullary cavity, which is correspondingly narrowed. The marrow is normal, save in the region of the junction, where it is fibrous.

In order to determine the possible infectious character of this disease, four half-grown and apparently healthy rats were inoculated with a suspension of bone marrow from rat Y_8.

One of the inoculated rats (55), killed twenty-eight days after subcutaneous injection, showed striking alterations in the bones and teeth. There was in this rat no gross deformity of the *thorax*, but an evident widening of the translucent zone of proliferating cartilage, and the adjacent bony part of the *ribs* was opaque and slightly thickened. The *femora* were broad and thick, and so soft that they could easily be cut with scissors. The *tibiæ* were bowed anteriorly.

Changes in the *teeth* were first noted four days before the animal was killed. The basal portions of the upper incisors were found to be distinctly swollen, translucent, grayish, and rounded, sharply marked off from the distal third, which was opaque and chalky white. During the next few days, the swelling and translucency extended almost to the tip of the tooth. The lower incisors were also less opaque than normally.

Microscopic examination: No changes were

found in any of the internal viscera. The *marked defect and irregularity of the dentin* is shown in Figs. 4a, 4b, 4c, and 4d, Plate 2. It is seen that on the convex surface of the upper incisors the irregularity in arrangement of the odontoblasts is such that these have apparently given rise to predentin both on their external and internal surfaces. They are thus disposed in a row on both sides of which is uncalcified dentin, and are connected by numerous cell strands with the pulp. The concave side of the tooth is calcium-free throughout its entire extent, and is pierced in many places by isolated spindle cells and occasionally by capillaries. The changes in the *ribs* and *femora* consisted merely of an increase in the width of the osteoid margins. No definite alterations were found in the cartilages.

periments were subjected by us to chemical analysis. The teeth and bones were prepared for this purpose by the method described in section II (page 281). Calcium was determined as before, *i.e.* by McCrudden's method. Magnesium was determined, in the liquid obtained as indicated in section II, by McCrudden's method.[15] Phosphorus was determined in portions of such liquid by the "official agricultural method."[16]

The accompanying plates (referred to first on page 286, and later in the foregoing protocols) illustrate certain of the statements in the above descriptions. Table 2 presents a summary of data from Dr. Pappenheimer's record and

Data pertaining to the content of Calcium in the Bones and Teeth, for various Groups of the Rats referred to in Table 2.

Groups of rats.	Percentage of calcium.	
	Bones.	Teeth.
1. Non-rhachitic and slightly rhachitic	23.03	27.99
2. Moderately rhachitic and markedly rhachitic	20.21	27.08
3. Completely thymectomized (excluding W_2)[17]	21.34	28.40
4. Control and incompletely thymectomized[17]	22.00	27.83
5. Rhachitic (stock)	20.74	25.96

[17] Rat W_2 (Table 2) evidently belongs to group 4 in this table. If the figures for the calcium content pertaining to rat W_2 are added to those of group 4 in this table, the average values for calcium become 22.22 and 27.87 per cent., respectively.

The foregoing protocols show that lesions of the bones and teeth were observed in thymectomized rats, in controls of the same litters, in stock animals, and in a rat inoculated with bone marrow from a thymectomized rat with lesions of the skeletal system.

There is little question that these lesions resemble closely those described by Morpurgo, in 1900, as infective osteomalacia of white rats. In his subsequent investigations, Morpurgo showed that in young animals, the spontaneous disease takes the form of rhachitis.

Teeth and bones from eighteen of the rats involved in Dr. Pappenheimer's experiments were subjected by us to chemical analysis. The teeth and bones were prepared for this purpose by the method described in section II (page 281). Calcium was determined as before, *i.e.* by McCrudden's method. Magnesium was determined, in the liquid obtained as indicated in section II, by McCrudden's method.[15] Phosphorus was determined in portions of such liquid by the "official agricultural method."[16]

The accompanying plates (referred to first on page 286, and later in the foregoing protocols) illustrate certain of the statements in the above descriptions. Table 2 presents a summary of data from Dr. Pappenheimer's record and gives our analytic results for calcium, magnesium, and phosphorus.

Dr. Pappenheimer's general conclusions from the *histological* data were stated as follows:

Rhachitic changes in the bones and teeth occur in young albino rats as the result of spontaneous disease, possibly of infective origin. This disease is often, but not always, accompanied by an arrest of growth and malnutrition.

[15] McCrudden: *Journal of Biological Chemistry*, 1909, vii, p. 83.

[16] Bulletin 107, U. S. Department of Agriculture (1912); "Official methods of analysis, Association of Official Agricultural Chemists," p. 2.

There is no valid reason for attributing such lesions to the loss of thymic function. In some rats showing the disease, an unusual number of mitoses were found in the parathyroid glands, but no evidence of injury to these structures.

It has not been found possible to confirm the statements of Klose and Magnini as to the fatal effects of complete thymus extirpation in rats.

A general summary of our calcium data, as given in Table 2, is presented on the opposite page.

The values in this summary, and the chemical results in Table 2, make it evident, as we stated in our recent paper accompanying Dr. Pappenheimer's, that the foregoing *chemical* data agree, in the main, with the corresponding histological findings reported in Dr. Pappenheimer's paper. Our results indicate that the bones and teeth of the rats which were found by Dr. Pappenheimer to be moderately rhachitic and markedly rhachitic, contained in general less calcium than those from the non-rhachitic and slightly rhachitic animals. The lack of any particular trend of calcium content in the bones and teeth from the thymectomized rats, as shown by both the individual results in Table 2 and the group averages in the above summary, makes it impossible to ascribe to thymectomy, in these animals, any special influence upon the processes of calcification in the bones and teeth subjected to analysis. The validity of this negative conclusion is emphasized by the low values for calcium content in the bones and teeth from the unoperated rhachitic (stock) animals. That such spontaneously rhachitic rats happened to be among the number selected for Dr. Pappenheimer's experiments, and that rhachitic lesions observed in the thymectomized animals were due to causes independent of thymectomy, are necessary inferences under the circumstances. It is possible, of course, that determinations of phosphate content might have afforded indications of a special influence of thymectomy.[18]

[18] This suggestion was published before our data for magnesium and phosphorus were available. (See page 296.)

It is assumed by Dr. Pappenheimer and by us that the mixed food of the rats, which was given in abundance and eaten freely, was ample in quantity, in quality, and in metabolic availability for the maintenance of the processes of normal calcification in each animal. One cannot be certain of such an outcome in experiments of this kind, however, unless the animals are individually maintained under suitably controlled metabolic conditions on diets of definite composition, of known quantity, and of proved nutritional adequacy. We require also, for correct interpretations of analytic data on calcification, more exact chemical knowledge of the variations in the composition of the bones and teeth of normal albino rats of different ages under given metabolic conditions. It is our intention to investigate in this laboratory, as a part of a plan of research in progress, the facts in these particular connections, with special reference to the possible establishment of definite physiological standards on which further experimental work with albino rats may be conducted more accurately.

As was stated above, our data for magnesium and phosphorus were obtained after the publication of the paper by Morgulis and Gies that accompanied Dr. Pappenheimer's. Our summary of such data from Table 2 (see page 296) facilitates direct comparison with the above summary of the results for calcium, and also with the corresponding individual results for calcium.

The data in this summary appear to justify the conclusion that the proportions of magnesium in the teeth and bones of the rhachitic rats were higher than those of the non-rhachitic animals. The data in this summary are indefinite so far as influence on phosphatation is concerned. As our work progresses additional results in this connection will be accumulated.

In the discussion of his thymectomy data Dr. Pappenheimer referred instructively, as follows, to results pertaining to parathyroidectomy, in accord with our own views in this relation:

> Defective calcification of the dentin, and penetration of the uncalcified tissue by blood-

Directly comparative percentage data on degree of "calcification" (from Table 2).

Groups of rats.	Calcium.		Magnesium.		Phosphorus.	
	Teeth.	Bones.	Teeth.	Bones.	Teeth.	Bones.
1. Non-rhachitic:						
*U_1	27.48	22.61	1.51	0.60	15.28	10.90
U_6	28.29	22.74	1.91	0.52	15.80	12.45
W_4	28.99	23.75	1.54	0.53	17.12	. . .
Average	*28.25*	*23.03*	*1.65*	*0.55*	*16.07*	*11.67*
2. Moderately rhachitic:						
*Y_2	28.53	. . .	3.48	. . .	19.78	. . .
55	. . .	20.66	. . .	1.34	. . .	9.30
Average(?)	*28.53*	*20.66*	*3.48*	*1.34*	*19.78*	*9.30*
3. Markedly rhachitic:						
X_5	. . .	18.92	. . .	1.35	. . .	11.87
*Y_2	. . .	17.85	. . .	0.92	. . .	9.63
50	. . .	23.41	. .	2.62	. . .	13.88
53	. . .	. . .	2.79	. . .	. . .	. . .
Average	. . .	*20.06*	*2.79*	*1.60*	. . .	*11.79*

*The asterisks indicate thymectomized rats. The remainder were "control" or stock animals.

vessels and isolated cells from the odontoblast layer, regarded by Erdheim and his successors as characteristic of parathyroid deprivation, were observed also in many of the rats in the thymectomy experiments described above. In one rat there occurred a spontaneous fracture of the tooth. Less marked in my rats was the infolding and disarrangement of the ameloblast layer; but this appears to be of secondary importance also in the lesions attributed to parathyroidectomy, and when present is probably due to mechanical causes.

The question arises, therefore, whether Erdheim, who was familiar with the spontaneous rhachitic lesions of rats, was justified in attributing these changes to parathyroid insufficiency. Erdheim has brought forward his transplantation experiments as crucial proof of the part of the parathyroids in normal calcification. The "Transplantations-streife" is believed to correspond exactly in its localization with the period of functional activity of the implanted parathyroid tissue.

This would be entirely convincing were it not for the fact that such alternating layers of calcium-containing and calcium-free dentin not infrequently occur as spontaneous rhachitic lesions. They are associated, no doubt, with remissions and exacerbations of the disease, such as have been described by Morpurgo. Fig. 3 illustrates the striate deposition of the calcium in the incisor of a spontaneously rhachitic rat.

Without wishing to discredit the work of Erdheim, supported as it is by other facts indicating an influence of the parathyroids upon calcium metabolism, one cannot but emphasize the identity of these lesions, attributed to the loss of parathyroid function, with those occurring in the spontaneous rickets of rats.

As regards the infectivity of the disease and the nature of the inciting organism, studies made in coöperation with Dr. J. G. Hopkins have not as yet led to conclusive results. The occurrence of rhachitic lesions in a rat, examined twenty-eight days after inoculation of bone marrow from a spontaneously rhachitic animal, is of doubtful significance, since many of the stock animals killed at this time were found to be rhachitic. The recent experiments of Koch, in which typical rhachitic lesions were produced in puppies by the intravenous injection of streptococci, indicate that the infective factor has to be reckoned with in experiments dealing with the effect of extirpation of ductless glands upon bone development in dogs as well as rats.

Sufficient evidence, we believe, has been

brought forward to show that the bone changes described by Klose are in no way related to the loss of the thymus gland, but occur as the result of spontaneous disease.

The importance of giving due consideration, in experiments of this kind, to the possibilities of "spontaneous rickets," along with many other "variables," can hardly be overestimated.

IV. General Conclusions.

Our data for thyro-parathyroidectomy, while suggesting support of Erdheim's conclusions regarding the decalcifying effects of parathyroidectomy, are inconclusive. The experiments will be continued.

The experiments on thymectomy failed to show that calcification processes were in any way affected by removal of the thymus.

Rhachitic changes in the bones and teeth occur in young albino rats as the result of *spontaneous* disease, possibly of infective origin. This disease is often, but not always, accompanied by an arrest of growth and malnutrition (Pappenheimer).

Our experience has shown that many variables in studies of this kind must be more effectively controlled than previous workers (or we ourselves) have done, to insure reliable foundations for sound deductions regarding specific effects from particular causes.

These studies are in progress.

In the conduct of the calcium determinations we have had the co-operation of Dr. Alfred P. Lothrop, to whom we are greatly indebted for this assistance.

V. Bibliography.

The following references will put the reader on the main track through the literature regarding dental effects of extirpation of the parathyroid and thymus glands.

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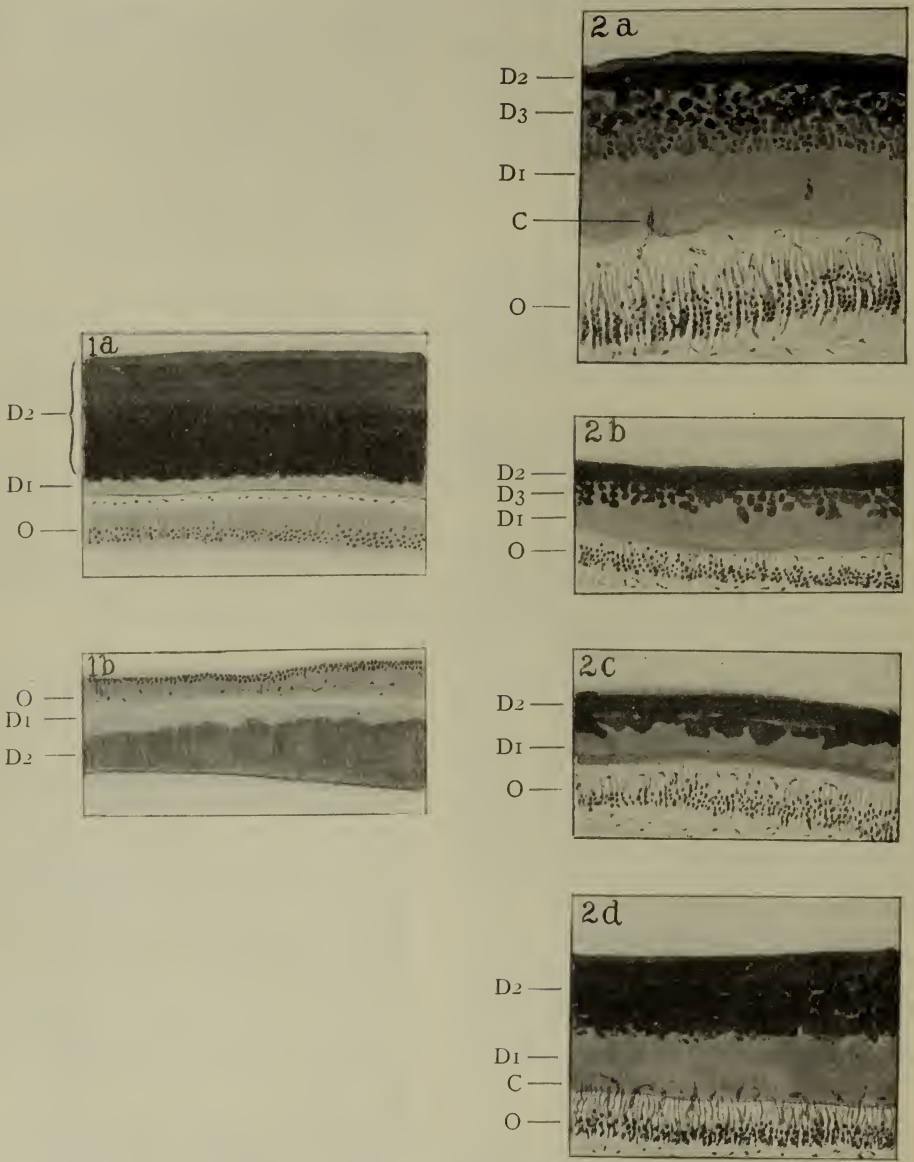
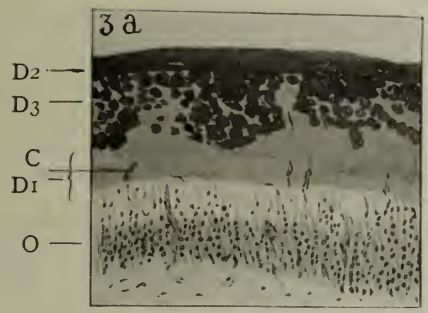
PLATE 1.



Pappenheimer: "Effects of Extirpation of Thymus in Rats."

(Plates reprinted, by permission, from the *Journal of Experimental Medicine*, vol. xx.)

PLATE 2.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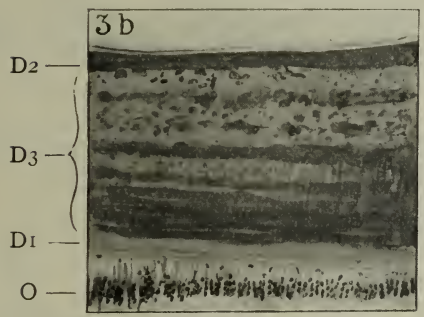
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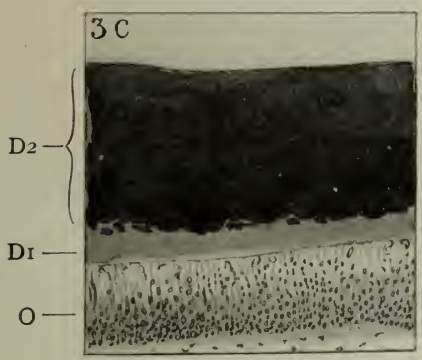
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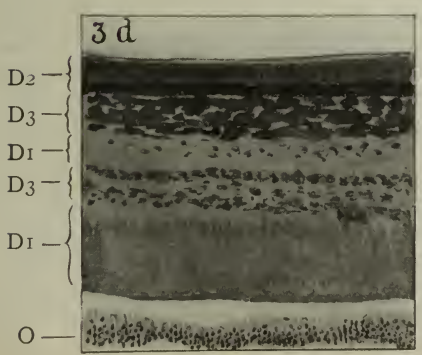
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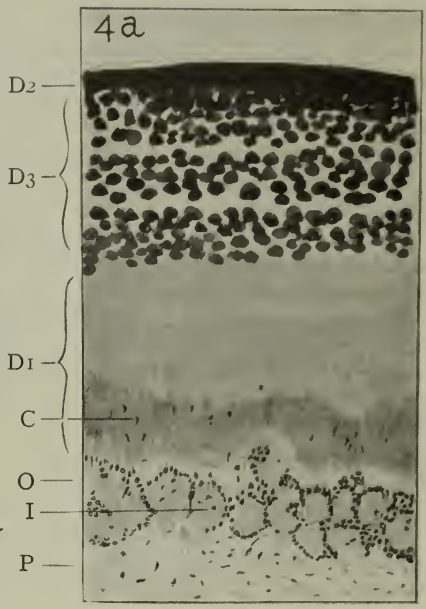
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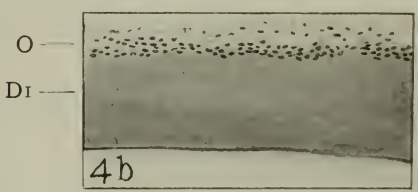
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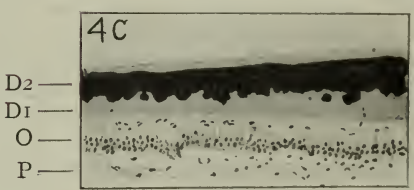
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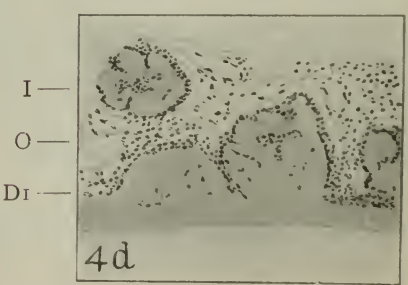
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VI. Explanation of Plates.

Plate 1.

Fig. 1a. Rat O_1. Thymectomy. Killed after 120 days. Upper incisor, convex side. D_1 = calcium-free dentin. D_2 = calcified dentin. O = odontoblasts.

Fig. 1b. Same tooth, concave side. Normal relations between calcified and uncalcified dentin.

Fig. 2a. Rat X_2. Thymectomy; accessory thymus. Killed after 151 days. Upper incisor, convex side, about middle of tooth. Defective calcification of dentin, ingrowth of bloodvessels from odontoblast layer. D_3 = incompletely calcified dentin. C = capillary.

Fig. 2b. Concave side of same tooth. Same designations.

Fig. 2c. Lower incisor, concave side.

Fig. 2d. Lower incisor, convex side.

Plate 2.

Fig. 3a. Rat X_5, control. Killed same time as X_2. Upper incisor, convex side.

Fig. 3b. Upper incisor, concave side. Deposition of calcium in layers.

Fig. 3c. Lower incisor, convex side.

Fig. 3d. Lower incisor, concave side. Alternating striæ of calcium-containing and calcium-free dentin.

Fig. 4a. Rat 55. Injected subcutaneously with suspension of bone marrow of the rhachitic rat Y_8. Killed after 28 days. Upper incisor. Incomplete calcification of dentin. Irregular disposition of odontoblasts. I = islands of uncalcified dentin. P = pulp.

Fig. 4b. Upper incisor, concave side. Dentin wholly calcium-free. Odontoblast layer indistinct.

Fig. 4c. Lower incisor, convex side.

Fig. 4d. Lower incisor, concave side. Dentin entirely uncalcified and convoluted. Ingrowth of odontoblasts and capillaries.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

RADIANT HEAT AND BLUE LIGHT IN THE TREATMENT OF PYORRHEA AND OTHER MOUTH DISORDERS.

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MUCH earnest study and careful scientific investigation have been given, during the last few years, to the different forms of radiant energy as applied to therapeutics; and the results obtained have been so flattering that we are warranted in including them in our list of valuable curative agents. Thus, we have radiant heat from various sources; brush discharges in vacuum; the various forms of light (luminous, or visible, rays); the ultra-violet rays; the N-rays of Blondlot; the cathode rays (or electrons of Crookes), the progenitors of the Roentgen, or X rays; and the alpha, beta, and gamma rays of radium and radio-active substances.

THE PHYSIOLOGICAL MANIFESTATIONS OF RADIANT ENERGY.

The infinite energy of nature is received by and transmitted through the universal ether that fills all space, by means of wave motion manifesting itself in the forms of heat, light, sound, and chemical and electrical actions of different kinds. These varied forms of energy, differing only in the frequency and direction of their vibrations, are transmitted to our consciousness by means of nerves specially organized or attuned to receive them or to respond and vibrate in harmony with the stimuli which they set up. Hence we become aware that we are alive; and this awareness, through the normal functioning of the nerves of the special senses, leads to the production of thought and the wonders of the human intellect. Our tissues, too, seem to have the power of attuning themselves to the differing vibration frequencies coming from sources of complex and mixed vibrations, such as the sun and the electric arc, and of deriving from them the energy required

to maintain their functional activity. "Heat and light," says Langley, "are not things in themselves, but different sensations in our own bodies or different effects in other bodies—are merely effects of this mysterious thing we call radiant energy."

Under conditions which are a part of our normal environment, these heat and light frequencies exert a beneficial influence. But under abnormal or unusual conditions of exposure to the radiations from the sun or the higher frequencies of the Roentgen rays and the radium emanations, inhibitory or depressing effects may be produced. They must therefore be carefully and rationally used as therapeutic agents.

VISIBLE LIGHT AND THERMAL FREQUENCIES AS THERAPEUTIC AGENTS.

In the present discussion on radiant light and radiant heat, we are concerned with the spectral, or light rays, also called luminous rays or visible light frequencies, and the infra-red or heat rays (invisible light rays), also known as calorific rays or thermal frequencies. Since the effects of these two forms of radiant energy upon living tissues are similar, and because they are given off together from such therapeutic instruments as the arc lamp and the incandescent therapeutic lamp, it is in order to treat them together, since both are indicated in several conditions with which the dentist has to deal.

The heat of the sun is transmitted to the body without affecting the temperature of the intervening medium, the ether. It is therefore said to be radiated, or radiant. The same is true of the heat radiated from a source of artificial light, as the incandescent lamp.

Of the thermal frequencies which strike a body, some penetrate and some are reflected in the same manner as are the light frequencies. The absolute reflecting power (the ratio of the quantity of heat absorbed to the quantity of heat reflected) of highly polished metal surfaces stands in the following relationship, the first named being the highest: Silver plate, gold, brass, platinum, steel, zinc, iron, cast iron. Hence, polished silver would seem to be the best reflecting surface for lining therapeutic lamps where the maximum thermal efficiency is desired.

Melloni has shown that certain substances, such as rock salt and carbon disulfid, transmit heat, or are diathermanous; while others, such as copper sulfate and distilled water, are almost athermanous. The terms diathermancy and athermancy, applied to heat, correspond to the words transparency and opacity with reference to light. Rock salt is analogous to transparent glass, copper sulfate to sheet lead. Practical use was made of these facts by the famous Danish scientist, Niels Finsen, in his tube for light treatment by the use of the so-called Finsen rays. He used distilled water in his apparatus to cool the condensing lenses, and copper sulfate to filter out the heat rays, when making use of light energy in the treatment of lupus and other skin diseases.

The infra-red radiations, or thermal frequencies, have been shown to have greater penetrating power, unit for unit, on body tissues than the higher visible frequencies of the spectrum and the invisible ultra-violet and Roentgen rays. The latter are invisible, are without heat rays, and can only be demonstrated from their fluorescent and actinic effects; the infra-red, also invisible, being discerned by means of the thermopile and other heat-registering apparatus.

The value of blue light as a therapeutic agent has been pointed out by Professor Minim of St. Petersburg, Dr. Niels Finsen of Copenhagen, Dr. Margaret A. Cleaves of New York, and by other writers on light therapy and electro-therapeutics, among whom may be mentioned Kassabian, Martin, Hilliard, and Redard.

EFFECTS OF BLUE-LIGHT TREATMENT.

In very elaborate experiments carried out at the Institute of Physiology, in Naples, by Dr. R. Pansini, it was shown that blue light reduces the reactions of

the cerebral cortex and prevents stimuli applied to one motor area from spreading to others, thus acting like anesthetic agents such as morphin, ether, or chloroform when applied to the cortex. In maniacal conditions, blue light produced a transient calmness. Pansini found, moreover, that bandaging the eyes of his subjects made no difference in the effects produced, which tends to uphold his claim that the results produced are due to the penetrative action of the blue light and its action on the circulation.

Dr. M. A. Cleaves is of the opinion that it is the direct action of the blue light upon the blood itself which produces its effects, the light energy being converted into chemical energy, producing increased oxidation from the storage of more oxygen in the red blood corpuscles. She suggests as a theory of the action of blue light that "Because of the powerful action of the chemical frequencies of light upon the blood, the systemic toxic condition which is reacting upon the supreme nerve centers is overcome through the increased oxidation power of the blood" produced by the blue radiations.

Blue glass screens are used in conjunction with the thermal frequencies of the various therapeutic lamps, such as the Minim lamp, the marine searchlight, the Betz lamp, the leucodescent lamp, and the very serviceable portable lamp called the "Multum-in-parvo." Blue glass screens prevent the passage of the ultra-violet frequencies, thus avoiding the unpleasant tanning effects of these rays, which might be objectionable as well as interfere with the therapeutic action of the blue rays. They also keep out the lower frequencies which have irritant effects, such as the red. The total heat radiations are also reduced by the use of the blue glass.

The experiments of Kaiser, reported in the *British Medical Journal,* have shown the value of blue light in killing cultures of the tubercle bacillus and as a resolving agent for tuberculous abscesses. He also regards it as a local sedative and even as an anesthetic. He reports cures of tuberculous skin diseases, such as lupus vulgaris and erythematosus, by means of blue light.

The name "Minim" light is often given to blue light, from the work of Dr. Minim of St. Petersburg, to whose classic essay on the subject we are indebted for much of our knowledge. He believes that blue light acts on the vasoconstrictors, has analgesic properties, and that it will relieve or cure superficial neuralgias. He claims to obtain the best results when the patient is at some distance from the source of light, so as not to be acted upon by the residual thermal frequencies given off from the lamp. He and also others have claimed to produce anesthesias sufficiently profound for the performance of minor surgical operations.

Minim reports a very interesting case of injury to the mouth and throat from the accidental swallowing of ammonia, which was cured by several treatments with the Minim lamp, the rays being applied to the mucous membrane of the mouth and to the front of the neck. Many cases of minor surgical operations under blue light anesthesia are recorded in medical and electro-therapeutic literature. Some of these effects have been wrongly attributed to the ultra-violet frequencies by various writers. When incandescent lamps are used, the ultra-violet rays are prevented from passing by the glass. Thus the effects claimed to be due to the ultra-violet rays, when glass-inclosed sources of light are used, are in reality due to the chemical rays of the spectrum, principally the blue, indigo, and visible violet. Hence we should beware of being cajoled into the belief that vacuum tubes, such as are supplied with many high-frequency machines, are of great therapeutic value due to ultra-violet radiations. Pure quartz, on the other hand, will permit the passage of the ultra-violet rays.

We may sum up the advantages possessed by the higher visible frequencies, the chemical rays, or so-called blue light, in therapeutics, thus:

(1) Bactericidal.

(2) Vaso-motor constrictor, causing local anemia.

(3) Analgesic, and possibly somewhat anesthetic. If the action be prolonged, equalization of the circulation and hyperemia result.

(4) Sedative action on nerves and cortex.

(5) Increased metabolism due to the chemical action of the rays on the blood, increasing oxidation.

THERAPEUTIC ADVANTAGES OF THE COMBINATION OF LIGHT AND HEAT.

Enough has been said, I believe, to show that the two forms of radiant energy, light and heat, stand in close relation to one another, and that pathological conditions calling for the therapeutic exhibition of the one will usually be benefited by the concomitant employment of the other. By combining these two forms of radiant energy we can produce positive chemotactic effects, stimulating metabolism through the hyperemia induced, and promoting elimination through the action of the glands of the skin, while at the same time producing a beneficial reflex reaction through stimulation of the peripheral nerve-endings. Solar and incandescent light and heat have proved of great value in the replacement of tissue waste, as witness the sun-bath and the electric-bath annexes of tuberculosis sanitaria. Both radiant heat and convective heat are now firmly established therapeutic measures in general medical practice.

The effects of the two forms of radiant energy under consideration are both local and general—the general effects being due to the heating of the blood stream, the increased elimination through the skin and lungs, and the sterilizing and oxidizing action of the light rays penetrating into the blood channels. Those light rays which do not penetrate through the periphery of the body evolve heat radiations, in contrast to the X rays, which pass through without heat evolution. The hyperemia induced brings fresh blood to the affected part, with its phagocytes and leucocytes, inducing more rapid resolution and hastening recovery, while the bactericidal effect of light on the pyogenic and other bacteria is too well known to require more elucidation.

We may sum up as follows the physiological effects produced by the radiant light and heat frequencies:

(1) Increase in rapidity of tissue repair by inducing phagocytosis and leucocytosis.

(2) Destruction of pathogenic bacteria.

(3) Removal of waste products by the stimulation of the eliminating organs and the oxidizing action of the blood.

(4) Prevention of stasis in traumatic injuries, as after the surgical scaling of the roots of teeth in pyorrhea.

(5) Analgesic and soothing effects on the nerve terminals in mucous membranes and the skin.

(6) Reflex action on the spinal centers due to peripheral stimulation.

(7) Lowering of arterial tension and relieving congestion.

APPLICATION OF LIGHT AND HEAT FREQUENCIES IN DENTAL PRACTICE.

I have found the use of radiant energy in the form of heat and blue light to be of considerable value in practice, as will be evidenced by the case reports appended hereto. In my hands one of the small therapeutic lamps of the portable type, using a simple blue glass screen, has been used as an adjunct in the surgical treatment of pyorrhea alveolaris and allied disorders of the gingiva, the alveoli, and the mucous membranes of the mouth; in cases of severe pericementitis combined with pulpitis; in neuralgias, of dental and other origin; and in cases of headache, eye-strain, and other painful disorders, such as dysmenorrhea and the neuralgia following appendectomy, it has been of service as a household remedial agent.

In using the lamp without the blue screen, great care must be used not to burn the tissues over which it is applied. It is well to keep the light moving over

the surface to be treated, and if it becomes too greatly heated, to occasionally pass the hand or a folded cloth between the lamp and the part. For use after surgical scaling in pyorrhea, I have found it best to use the blue screen (which must be of real blue glass, which will cut off the lower and higher frequencies), which will enable the operator to get the combined action of the heat rays and the soothing or analgesic effect of the blue rays. The patient is instructed to look directly into the blue screen, the mouth being held open widely, and the lips held out of the way by any convenient method, so that the light and heat rays can reach all parts. Applications of ten to fifteen minutes are given, or less if relief from pain is obtained sooner. I have found, in quite a number of cases of pyorrhea alveolaris and other gingival disorders requiring much severe scaling, which have been under treatment during the last few months, that the great soreness which usually follows this work is much relieved and passes away much sooner if the therapeutic lamp is used; and I believe that the total time required to obtain a cure of these conditions is shortened by its use.

REPORT OF PRACTICAL CASES.

Case I. Mrs. D., graduate nurse, former superintendent of one of our largest hospitals; wife of a physician; age about thirty. The patient had developed an axillary abscess, and had not been without a daily rise in temperature for six weeks prior to her first visit to my office. Her family physician had prescribed autogenous vaccines, which had been given in conjunction with medication, without effecting a cure. She was referred to me by her family dentist, who had not seen her for several years. I found pus flowing from the alveoli of most of her teeth. I told her that from ten to fifteen treatments would be required, using the surgical method of Dr. R. G. Hutchinson, Jr., of New York, the treatments to be of about one hour's duration each. With the third treatment I began the use of the therapeutic lamp after finishing the scaling, to the patient's great satisfaction. She told me at the next sitting that her gums did not hurt her nearly as much the day following treatment as on former occasions; at the fourth treatment she told me that she had been free of her daily temperature rise for two days, but that it had returned on the day of treatment before coming to my office. I gave the patient seven treatments altogether, and dismissed her as cured.

At the fifth treatment, after finishing with the therapeutic lamp, she said: "Doctor, you hurt me enough several times today to make the tears come into my eyes, but since you have used the lamp I feel almost as if I had not undergone a treatment today."

At the last treatment, the seventh, she told me that she had not had a recurrence of her daily temperature rise for a whole week, and that both she and her husband attributed this to the cure of the pyorrhea. She also attributed the axillary abscess to the pyorrhetic condition. A month after her last treatment she reported having had no recurrence of high temperature or pus.

Case II. Miss M., a young woman of about twenty years, developed pulpitis while in Los Angeles, when about to return to New York. She did not seek treatment there, and suffered more or less all the way across the continent. She came to my office immediately on her arrival in Brooklyn. I found a cavity in the lower left third molar, exceedingly sensitive, combined with severe pericementitis and neuralgia extending into the ear. I treated the tooth with arsenical fiber for devitalization, and used the therapeutic lamp on the face, with great relief to the patient. The pain returned after the removal of the pulp, which was very resistent to arsenic and gave considerable pain in removal. The heat and blue light always allayed the neuralgia. The pericementitis, combined with the sympathetic irritation set up in the ear, finally became so unmanageable that it was decided to extract the tooth, which showed that my diagnosis was correct. After extraction the pain persisted for three days, when the patient presented and I gave her another treatment with the lamp, which eased the condition to such an extent that a complete cure soon followed.

Case III. Mrs. V. developed a severe nervous headache, with a strained feeling of the eyes. As soon as the blue rays struck the face a sense of relief was experienced, and the headache also passed off in a short time.

Case IV. Miss S., a woman of about forty-five years, presented with a pyorrhea due to large accumulations of calculus, of both the serumal and salivary types. She claimed to have seen her dentist regularly, but that he

had not scaled her teeth. My opinion is that the tartar had not been removed in twenty years. Several teeth were so loose that I removed them with my fingers. Twenty-two teeth could be preserved. The patient was very nervous, but courageous. I followed the severe scalings necessary with the therapeutic lamp treatment, always with an expression of satisfaction on the part of the patient for my "kindness" in taking the soreness out of her mouth. I told the patient before commencing treatment that it would probably require about fifteen treatments to effect a cure. I dismissed her as cured after nine treatments. I believe that the soothing and healing effect produced on the gums by the use of the lamp was an important factor in bringing about such a rapid recovery in this case.

Case V. Mrs. A., a woman of thirty; very nervous. Severe neuralgia following surgical removal of pulp in an upper bicuspid, extending over the face as far as the temple. Ten minutes' treatment with the lamp relieved the condition, and the patient expressed her great satisfaction in enthusiastic terms.

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THE ENTOMBMENT OF A TOOTH IN A GOLDEN CASKET.

By F. M. WILLIS, D.D.S., Ithaca, N. Y.

(Read before the Syracuse Dental Society, November 10, 1914.)

A TOOTH which has been crowned with gold is buried in a golden coffin, and the time of its final dissolution is in direct ratio to the care with which the crown was fitted and cemented. I make this statement deliberately, as it is my honest conviction, after having done such work extensively for more than twenty years.

REASONS FOR FAILURES OF GOLD SHELL CROWNS.

Invisibility of abutments. There are many reasons why a gold-crowned tooth fails; but the main reason is that the tooth is entirely hidden from view, and if trouble ensues it is often not discovered until the tooth is destroyed beyond repair. For my own mouth I constructed a lower bridge, using the second molar and second bicuspid as anchorages, which supported a first molar dummy. The bridge was carefully cemented to place by Dr. E. E. Harrington of Watertown, N. Y., who stated at the time that he never saw a more perfectly fitted bridge. After seven years, the bridge became loose, though there was no sensation whatever in the abutments. The bridge was subsequently removed, when it was found that the molar abutment was entirely gone, except the root, which still remains in my mouth, covered over with copper cement, a black monument to the failure of bridge work. A sufficient number of the best bridges have traveled the same road, in my observation, to make bridge work an uncertain

procedure, owing to the fact that we cannot see what is going on under a gold crown. In my opinion a badly broken-down molar or bicuspid is far better off when partially built up with amalgam or with a gold inlay than when fully restored with a gold crown. In my practice I carry out this principle, and many teeth which were formerly consigned to an early grave in a golden casket are now restored by me to long life and usefulness by being carefully built up with amalgam or a gold inlay.

Other reasons why gold crowns are often fatal to the teeth are—

(1) *The difficulty of so shaping the tooth that a perfect fit may be obtained.* On studying the anatomy of extracted teeth, we find that the circumference of the large part of the crown is from two to five millimeters greater than that of the neck of the tooth. In order to secure a close fit at the gingival margin of such a tooth, it would be necessary to remove all the enamel from the tooth. This difficulty may be lessened by devitalizing the tooth, but the practice of indiscriminately devitalizing the pulps in posterior teeth is rash folly. No dead tooth is as good as a vital one, no matter how carefully the pulp may be removed and the canals filled. A dead tooth proves an uncertain quantity in a sufficient number of cases to render it advisable for us to shun devitalization whenever possible. In rare cases, where a deviated molar is to be crowned with gold as abutment for a bridge, devitalization, with all its uncertainty, is not only permissible but advisable. In many cases, however, where the crown of the tooth leans decidedly, sufficient and preferable anchorage may be obtained by extending the gold band only one-half or two-thirds the distance to the gum margin. Such an attachment is entirely free from the most objectionable features of an entirely covered tooth.

(2) *The practical impossibility of perfectly cementing a crown which extends under the margin of the gum.* This is the vulnerable point in a tooth capped with gold; there is a moist zone around the neck of the tooth, just under the free margin of the gum, which cannot be thoroughly dried, and consequently that portion of the crown is never properly cemented. This can be partially overcome by allowing the crown to be worn for a few days, without being cemented. Then the gum will stand away from the tooth far enough to allow fairly good drying of the neck of the tooth when the crown is cemented. By filling the crown full of cement, as advised by Dr. George W. Melotte, any moisture at the neck of the tooth will be forced away by the oncoming cement.

(3) *Irritation of the soft tissues by the edge of the gold band.* No matter how much care is used in fitting the gold band around the neck of the tooth, it is practically impossible to prevent more or less irritation. Some operators will undoubtedly deny this, but a careful examination will, in a large percentage of cases, show irritation of the gum margin to a greater or less extent. This irritation is not always fatal to the tooth, but it is an unhygienic condition to be avoided, if possible. This difficulty may be reduced by using scrupulous care in fitting the gold close to the tooth, beveling the edges properly, and allowing the gold to extend only very slightly under the free margin of the gum.

(4) *Injurious effect of a large mass of metal upon the tissues.* The presence of a large quantity of metal in the mouth is injurious to the tissues. It increases thermal shock and promotes electrical disturbances in the mouth. Gold is worse than amalgam in these respects, because of its greater density.

(5) *Conspicuousness of appliance.* The comparative ease with which a showy piece of work may be made appeals to the uneducated patient and is profitable to the dentist.

These criticisms concern the ethical dentist and the ten-dollar crown; and if these charges are true, how about the five-dollar crown made by the dental quack, with its miserable shape, its bad articulation, and its fatal effect upon the soft tissues at the neck of the tooth?

THE PATHOLOGY AND ETIOLOGY OF PYORRHEA ALVEOLARIS.

By PERCY R. HOWE, A.B., D.D.S., Boston, Mass.

(Report presented to Section II, Sixth International Dental Congress, London, 1914.)

THE term Pyorrhea Alveolaris has been the subject of much criticism. It is maintained that it does not adequately describe those earlier characteristics of the disease with which we are familiar. It does, however, depict the most active and advanced state of the condition that it designates, and presents, therefore, the most favorable aspect for its study.

It is unnecessary to describe those clinical aspects of this disease that are common to every text-book, but which very properly might come under the topic of this paper, for these are matters of everyday practice. This fully developed pathological condition presents three distinct phases, the consideration of which, in view of more recent developments from laboratory researches, adds to our understanding of the processes involved in its advancement, or, *per contra,* its restraint. I refer to bacterial activity, pathological calcifications, tissue degeneration. These three processes accord with general physiological principles in that while they are distinct processes, yet they are more or less interdependent. With this in mind their separate consideration may be profitably undertaken. Notwithstanding the numerous organisms that have been from time to time reported in connection with this disease, and that have been made the basis of vaccine therapy, yet for reasons which will appear in the discussion of these micro-organisms we must account the greater part of them merely associate forms, pus organisms, or indicative of disturbances of a different nature.

BACTERIOLOGY.

The most recent work upon this disease, done by the distinguished bacteriologist Dr. Hideyo Noguchi,* of the Rockefeller Institute of Medical Research, is of the greatest interest to our profession. By reason of improved cultural methods Dr. Noguchi has discovered a new species of spirochæta, which he has called *Treponema mucosum.* This organism is anaerobic, requires from eight to ten days for its growth, is mucin-forming, and produces odors characteristic of the disease. In form it is above half as large as the *Vincenti* spirillum, its curves being much more regular, and similar to the organisms of syphilis. Further interest in it arises from the fact that it will not grow on healthy tissue, but requires such a tissue as occurs in disturbed metabolic states. It is not strictly parasitic, but exerts a pyogenic action upon the tissue in which the growth occurs. In addition to this, Dr. Noguchi has reviewed and revised the works of other authorities, and has isolated in pure cultures other forms of micro-organisms, among which he finds the *Treponema microdentium* very commonly present, as well as the *Spirillum Vincenti,* together with fusiform bacilli. These, then, are the micro-organisms most intimately connected with pyorrhea alveolaris. They are capable of producing odors similar to those that accompany

* Noguchi, Hideyo, "*Treponema mucosum* (new species), a Mucin-producing Spirochæta from Pyorrhea Alveolaris, Grown in Pure Culture," *Journ. Exper. Med.*, vol. xvi.

this disease, and one is mucin-forming. The infection is secondary, the etiological factor being of metabolic origin, as has long been held, and in which opinion Dr. Noguchi, as a result of his studies, concurs.

The pneumococcus has perhaps been mentioned in connection with this disease as much as any micro-organism, and it has been made the basis of vaccine therapy. For this reason it may be well to give it a brief consideration. It is undoubtedly possible to isolate the pneumococcus from any mouth condition. Fifty per cent.* of the mouths of healthy persons taken at random will show the presence of this micro-organism. Miller† calls attention to an organism similar to the pneumococcus that very commonly occurs in the mouth. Considerable confusion has existed regarding the biology of these organisms, so that they have been referred to as the "pneumococcus-like organisms," and, on account of their morphological similarity to the true pneumococcus, some very elaborate study has been devoted to them, and the attempt made to establish the relationship between them and pneumonia. It has been concluded that some of the organisms cannot be distinguished from the true pneumococcus, either morphologically or physiologically, but that there are others, similar culturally, that react differently in fermentation and agglutination tests. The streptococcus mucosus is a member of the same species, is found freely in the mouths of healthy individuals, reacts similarly in the agglutination tests, and is undoubtedly closely allied with the mouth pneumococci. Other organisms found in healthy mouths are undoubtedly temporarily or permanently modified forms of this class of micro-organisms. These are common mouth bacteria. Hiss‡ states that in seven healthy individuals under observation for study, in repeated tests extending over weeks and months, the pneumococcus was on some occasions demonstrated to be present in the saliva in six out of seven cases, or 85.7 per cent.

So that it may be seen that the weight of evidence is very much against the supposition that this class of organisms is closely responsible for the disease pyorrhea alveolaris, and that if we are to employ vaccine therapy we should base our therapeutic measures upon the teachings of the more recent revisions of the bacteriology of this disease. It would be very interesting to note the effect with vaccines prepared from treponema mucosum, or the Vincenti spirillum.

FORMATION OF CALCARIOUS DEPOSITS.

The next process for consideration is that of the formation of the calcarious deposits upon the teeth. These deposits, referred to as salivary or serumal tartar, according to the medium of their formation, are not widely different from calcarious deposits in other parts of the body, and the principles governing such pathological calcification, whether of the eye, the brain, the heart, the kidney, the liver, or of the intima of the arteries, are, in the main, equally applicable here.

It comes properly under the heading of this paper for us to consider these principles and to support the idea of the connection between these deposits and other pathological calcifications with laboratory evidence.

It has been shown by experimentation that almost any tissue of the body may become the seat of calcification* providing it is degenerate. Cartilage and colloidal material are among those most readily calcified. In the case of the peridental tissues we find them to be of a cartilaginous character, while from the secretions of the mouth we find altered and evascular colloidal constituents, both of which form a most favorable ma-

* Buerger, Leo, "Studies of the Pneumococcus and Allied Organisms with Reference to Their Occurrence in the Human Mouth," *Journ. Exper. Med.*, vol. ix.

† Miller, "Micro-organisms of the Human Mouth."

‡ Hiss, Philip Hanson, "A Comparative Study of Pneumococci and Allied Organisms," *Journ. Exper. Med.*, vol. ix.

* Harvey, W. Henwood, "Experimental Bone-formation in Arteries," *Journ. Exper. Med.*, vol. xii.

terial* for calcarious deposition. While these conditions invite calcification, other factors must enter into the consideration of this process, among which may be mentioned over-saturation of the blood or saliva with calcium salts. The blood and the saliva not only contain carbonates and phosphates, either of which would precipitate the other in the test tube, but contain these elements in excess of their solubilities in water, variously stated, but given by one investigator as from two to four times as much. The blood of mammals varies but little in its calcium oxid content, being about 0.011 per cent. to 0.013 per cent. (Abderhalden.) Other investigators give a slightly higher estimate, but according to my analyses the CaO content of the saliva agrees very closely with Abderhalden's estimate for the blood, or from 0.011 per cent. to 0.015 per cent. CaO. There are two factors to account for this quality of holding an excess of CaO in solution that are common to the blood and the saliva. They are the CO_2 and the adsorption property of the colloids. It is mentioned in dental literature that the calcium salts of the saliva are held in solution by the CO_2, and in fact the usual explanation of the deposits of salivary calculus is that the calcium salts are held as bicarbonates, and upon the escape of CO_2 the calcium is precipitated. This explanation is in measure true, but it is hardly a complete one and is open to criticism, for while the free CO_2 in the saliva may hold the calcium phosphate in solution, and the calcium carbonate exist as bicarbonate, so that the escape of the CO_2 would allow both the phosphate and the carbonate to become precipitated, we would expect to find almost universally the constant deposition of the calcium, whereas it is deposited only under specific conditions. Much study has been devoted to the question of the form in which the calcium exists in the blood. and Wells, in extensive researches on calcification, adopts the conclusions of Barillé,* who holds that the calcium phosphate is present in the blood as a carbon phosphate, an unstable compound that decomposes to form a biphosphate and a bicarbonate, and there are many reasons to believe that it is in this form that these salts exist in the saliva:

$$Ca_3P_2O_8 + 4H_2CO_3 = H_2O + P_2O_5Ca_2H_2 : 2CO_3(CO_3H)_2Ca.$$

When the CO_2 escapes or is neutralized, the mixture of carbon phosphate is precipitated; in an alkaline medium the phosphate comes down as tribasic, and in an acid medium, such as the urine, as dibasic calcium phosphate. The more alkaline these fluids become, the less able they are to retain the calcium salts in solution. "It is a well-known fact that, no matter how sclerotic the walls of a vein may become, they rarely, if ever, calcify, so long as there is venous blood rich in CO_2 flowing through them." Hoffmeister and Tanaka† have shown that pieces of ivory are most rapidly absorbed in tissue where metabolism is most active (and where by inference the most CO_2 is produced). Active metabolism is, then, a very considerable factor in calcium deposition.‡ So that while the CO_2 is an important factor in maintaining in solution the calcium salts that are present in the fluids that constantly bathe the parts undergoing calcification, yet it is not the sole factor, for it leaves out of consideration the very important properties of the colloids, of the mucin of the submaxillary and sublingual glands, and the globulin and albumin of the parotid glands, as well as the colloids of the blood. The colloids are supposed to be

* Lichtwitz, "Ueber die Bedeutung der Kolloide für die Konkrementbildung und die Verkalkung," *Deutsch. Med. Wochenschr.*, vol. xxxvi.

* Barillé, "Carbon-phosphates tricalciques," *Journ. de Pharm. et chim.*, 1904, series 6; 1910, series 7.

† Hoffmeister, "Ueber Ablagerung und Resorption von Kalksalzen in den Geweben," *Ergebn. d. Physiol.*, vol. ix.

‡ Wells, H. Gideon, "Calcification and Ossification," *Arch. Int. Med.*, 1911, vol. vii.

held in suspension, while the crystalloids are held in true solution. Part of the crystalloids become concentrated at the surface of the colloids, and the withdrawal of these from the solution allows more to be taken up, so that colloids, by their adsorption property, must here be considered when we look for an explanation of the manner in which it is possible for more salts to enter into solution than is possible in water solubility. That this property of the colloids is even more to be regarded than that of the CO_2 is to be seen by that series of experimentation which has shown that even upon the complete withdrawal of the CO_2 the colloids are capable of withholding these salts from precipitation.

CALCIUM SUPPLY DERIVED FROM FOOD.

In addition to the way in which these two different agents hold the calcium salts in solution in excess, there remains the fact of the supply of calcium through the food, and through the disposition that the system makes of this supply in its physiological processes. The substitution of foods with other bases, as magnesium and strontium, together with a low calcium content, has been proved by experimentation to act in an inhibitory manner upon ossification.

It has been shown that in acidosis the calcium of the blood is utilized to neutralize these fermentative or pathological acids. On this account we should expect to find erosion, rather than pyorrhea alveolaris, during a metabolic irregularity of this character.

On the other hand, excess of calcium in the food leads to its deposition within the bones. (Goitein.)

The calcium excretion is mainly through the intestinal tract. It has been shown that in certain intestinal crises, 60 per cent. more calcium is excreted than is taken in by the food. So that the importance of the influence of this part of the digestive tract upon the calcification process is very apparent.

From repeated examination of the saliva the writer feels that it is a safe statement to make that the calcium content of the saliva is greater in individuals who have attained their growth, and that as the tendency of the system toward excessive retention of these salts increases with age, so does the calcium content of the saliva. The analyses of tartar, both the salivary and the serumal, that I have carried out in my laboratory, show that these deposits contain the phosphate of lime and carbonate of lime in the proportion of from 85 per cent. of phosphate as tricalcium, to 15 per cent. of carbonate. Some magnesium is present, together with fats (neutral fats, lecithin, and soaps), and the stroma in which the deposit has occurred. With respect to the difference between the salivary and the serumal tartar, the only thing that is apparent from my examinations is that of the matrix of deposit. In this connection I have carried out many analyses with a view to determining the presence of urates, and compared them with controls, and I have never been able to convince myself of their presence. I have used the murexid tests and others. It will be seen from these analyses that these deposits, that are so intimately connected with the dental organs, agree very closely with analyses of calcific deposits in other parts of the body, particularly in respect to the proportion of the phosphate to the carbonate,* and with respect to the fats.

No matter in what form the calcium enters the system, or in what form it is deposited, it eventually becomes phosphate and carbonate, and in the proportion given.

In passing, it may be well to state that many analyses give a higher per cent. of carbonate. This is to be attributed to the ashing method, which converts many organic acids and compounds into carbonates. My own work has been carried out by titrations, the CaO estimated as oxalate, the CO_2 by freeing with HCl and KOH absorption, and the P_2O_5 has been determined by uranium, using potassium ferrocyanid as indicator.

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* Wells, H. Gideon, "Pathological Calcification," *Journ. Med. Research*, vol. xiv.

VARIOUS OPINIONS ON CALCIFICATION.

There has been a division of opinion in respect to calcification among research workers upon the subject. One school is represented by Wells in very elaborate studies upon the subject, viz, that the process is a physico-chemical one, depending upon an unknown selective property of the matrix that holds the calcific deposits. Oskar Klotz* is the exponent of the idea that fats and soaps† are intimately concerned in this process, and Hanes‡ advances a similar but more specific idea in his report upon the "Relation of Lipoid Metabolism in the Calcification of the Chick," in which he traces step by step the process, and shows that the phosphoric acid utilized in calcification is derived from phosphorized fats. Generalizing from his studies, he strengthens his views by reviewing the chemical analyses of the process of calcification in the intima of the aorta (the most frequent site of calcification in man), and demonstrates that the phosphoric acid is here supplied by phosphorized fats *in situ*.

However this may be, I have found neutral fats, phosphorized fats, and soaps present in these deposits, and more in the early stages of the formation, diminishing as the calcification proceeds.

Collecting the soft deposits that precede dense calcification, and also the scrapings of the soft tissue from the roots of freshly extracted teeth of pyorrheal cases, drying over sulfuric acid, and extracting with repeated applications of ether, a very appreciable amount of stainable fat may be found upon evaporation of the ether. Extracting again the tissue that has been treated with ether, with hot acid alcohol, the presence of a stainable fat is further to be found, or a fatty acid freed from a soap combination. After the ether has evaporated in the first instance, if an attempt be made to dissolve the fatty residue in acetone, a portion will float about undissolved, or lecithin, the phosphorized fat. It would not seem farfetched to conclude that with the phosphate content of these deposits, and with phosphorized fat present, and from the studies given above, a part at least of the phosphoric acid radicles might be derived from this source.

One thing more bearing upon this is that I find a very considerable amount of lecithin in the saliva, especially in the saliva of cases where rapid deposition is going on on the lower front teeth, where I have collected the saliva from the submaxillary gland by means of an apparatus that I have contrived and that I am accustomed to use in work of this nature; and using the same stimulus to incite the flow in cases for comparative study, I am able to get an uncontaminated saliva, and to exclude the possibility that the source of the lecithin might be other than through the gland. It seems very probable that this substance has a connection with this calcific formation.

The topic of *tissue degeneration* and its connection with pyorrhea, besides being a necessary requisite for the bacteria that are most intimately concerned in the process, is also a necessary part in this kind of pathological calcification, in the physical sense, as a selective matrix, or, in a chemical sense, as a source of phosphoric acid radicles from its fats. The pathology of the process may be beautifully demonstrated by micro-staining methods, particularly from the tissue upon the roots of freshly extracted teeth selected for the purpose.

By the use of pyrogallic acid the calcification may be seen to be proceeding in definite and detached areas. The phosphates may be seen by staining with silver nitrate. Bubbles of escaping carbonic acid gas may be seen to escape upon treating with strong acid. Fatty

* Klotz, Oskar, "Studies upon Calcarious Degeneration," *Journ. Exper. Med.*, vol. ix.

† Wells and Mitchell, "Studies on Calcification and Ossification," *Journ. Med. Research*, vol. xxii.

‡ Hanes, Frederick M., "Lipoid Metabolism in the Developing Chick, and Its Relation to Calcification," *Journ. Exper. Med.*, vol. xvi.

acids and neutral fats are shown by Sudan III and Scharlach R.*

THE QUESTION OF TREATMENT.

It is at this point that a division of opinion is held upon this disease; some believing that these tissues have become degenerate through local bacterial processes, and that by local treatment the disease can be obliterated; others believing that systemic states are the controlling factor.

It is true that a great deal can be accomplished by the constant removal of débris from the mouth, of whatever nature; but the constituents that go to make up the individuality of the blood and of the oral secretions are derived from that division of nutritional processes which is termed metabolic. Whether the secretions of the mouth shall enter the mouth with their proper proportion of inorganic salts, or with the mucin, the globulin, the albumin, or the fats unimpaired and free from morbid metabolites, depends upon systemic phases. And the same thing is true of the blood, Actual analysis indicates nothing else. From the laboratories of research workers an immense amount of data has been, and is, accumulating upon definite and specific actions in the physiological processes of metabolism. Yet while for the present we must speak of the metabolic states that accompany pyorrhea alveolaris as anomalous, still there are certain general principles that are applicable in the causing or the repressing of this pathological condition. Without any attempt to mention them in the order of their importance, we may recall the fact that when the human system is constantly, and for a long period, supplied with more nutrient material than its physiological requirements demand, a portion of the excess is stored as fat, and the other portions appear as partly oxidized metabolites, which the economy makes every effort to neutralize and to eliminate as best it may. As a result of feeding experiments carried out a number of years ago, I called attention to the effect of overfeeding upon the oral secretions, and spoke of having in mind the question of nutritional balance in this connection. And I am still of the opinion that this is one of the general considerations to be taken into account in an effort to suppress this complication.

Another important thing is to give attention to intestinal difficulties—not only on account of intestinal aid in getting rid of nutritional excess, and on account of its effect on the calcium output, but also on account of the many products of intestinal fermentation which pass through the protective defenses of the intestinal mucosa and the toxicclytic action of the liver and permeate the whole system. I have found indican in the saliva during intestinal attacks, and Combe* mentions the effect of intestinal fermentation upon a child who secreted several liters of saliva daily during these crises. So that it is seen how excretory substances appear in the mouth and how the glands are affected in their action by systemic complications. Complete balance studies of inorganic metabolites, and of the organic, show a great deviation from the normal in disease, and confirm the fact that a smoothly working human system is essential to perfect metabolism.

Without any consideration of the effect of different organs upon special bodily constituents, as, for example, the effect of the thyroids or parathyroids upon calcium control, we will say that active metabolism controls directly the CO_2, and we have shown its effect in maintaining calcium salts in solution. The colloids of the secretions we know but little about; drinking large quantities of water reduces their viscidity, however. Calcium in the food affects calcium in the bodily fluids, generally speaking. Fats are indicative of excess

* Baldauf, Leon K., "An Investigation of the Nature of Proteid Soap Compounds and the staining of Pure Fats and Lipoids by Scharlach R and Sudan III," *Journ. Am. Med. Association*, vol. xlix.

* Combe, "Auto-intoxications."

of nutriment, and phosphorized fats are influenced by the action of the liver. It is the writer's practice to accompany efforts at treatment of the systemic phases of pyorrhea by analysis of the saliva, in order that he may proceed more intelligently in his work—and he recommends the practice to others.

A CONTRIBUTION TO THE HISTORY OF EMETIN.

By HERMANN PRINZ, A.M., M.D., D.D.S.,
PROFESSOR OF MATERIA MEDICA AND THERAPEUTICS, SCHOOL OF DENTISTRY, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA.

DRUGS, like many other things which share in the process of evolution of the human race, have their romances. Ipecacuanha, which has been recently introduced by Smith and Barrett in the form of its alkaloidal salt, emetin hydrochlorid, as a curative agent in the treatment of pyorrhea alveolaris, and which from all appearances seems destined to be regarded as a specific for this disease, has had within the last four centuries a most interesting career. Since it has achieved the above-mentioned enviable reputation in our profession, it may not be amiss at this moment to record a few biographic data concerning its oscillations in the art of therapeutics.

Ipecacuanha, also written "hypecacuana" by the practitioners of bygone days—or known as *poaya* by the Brazilians—and commonly referred to as ipecac, is the dried root of what is commercially known as Rio, Brazilian, and Para, or as Carthagena ipecac. The name ipecacuanha seems to be of Indian origin, and may be interpreted as "vomiting-producing weed." It is a native of South America and was introduced in Europe at about 1617. The medical armamentarium of Europe received many notable additions through the various geographic discoveries of the sixteenth century. Especially the then newly discovered America added many most valuable drugs to the materia medica—among which cinchona bark, ipecac, coca leaves, cascara sagrada, golden seal, krameria root, balsam of Peru, and many others, some of which now have become obsolete—may be recorded as the most important representatives.

From an historic point of view, ipecac is first mentioned in literature by a Portuguese friar,* who it seems had resided in Brazil from about 1570 to 1600. He mentions three remedies for the "bloody flux," one of which is called igpecaya or pigaya. The drug here referred to is undoubtedly ipecac. Piso and Marcgraf, in their scientific exploration of Brazil, record the plant ipecacuanha, which they depicted, and they also described its medicinal properties. As stated above, it was introduced in Europe in 1617. Although well known from the accounts given by Piso and Marcgraf, and in common use in Brazil as a remedy in dysentery, ipecac was not employed in Europe prior to the year 1672. At that time a physician named LeGras brought from South America a quantity of the root to Paris, but administering it in too large doses he damaged rather than aided the reputation of this drug.

A few years later a merchant of Paris

* Most of the biographic matter of this sketch is culled from Flueckiger and Hanbury's "Pharmacographia," and various works in the history of medicine and pharmacy.

named Grenier or Garnier became possessor of 150 pounds of ipecac, the valuable properties of which in dysentery he vaunted to his medical attendant Afforty and to Jean Claude Adrien Helvetius, a pupil of the latter. Grenier presented a quantity of this new drug to Afforty, who, however, attached but little importance to it. Helvetius, on the other hand, was induced to prescribe it in cases of dysentery, which he did with the utmost success. He even caused placards to be affixed to the corners of the streets (one of which may still be seen in Paris) announcing his successful treatment with this new drug. Through Grenier he obtained ample supplies from Spain and sold it as a secret medicine. The fame of the cures effected with this drug by Helvetius reached the French court and caused some trials to be made at the Hôtel Dieu. These trials having been fully successful, Louis XIV accorded to Helvetius the sole right of vending his remedy. Subsequently, several well-known personages, including the Dauphin of France, experienced the beneficial action of this drug upon their own bodies. The King became again interested in this drug, and consulted with his physician, D'Aquin, and his father confessor, and through them negotiated the purchase from Helvetius of his secret for a thousand louis d'or, and made it public. The right of Helvetius to this payment was disputed in law by Grenier, but maintained by a decision of the Châtelet of Paris.

In 1696 ipecac was introduced into Germany by the renowned philosopher Leibnitz, who by its use had been cured of a severe case of dysentery. It became known in German literature as "Ruhrwurzel" (dysentery root), and only much later its name changed to "Brechwurzel" (vomiting-producing root). The first title seems to have been in general favor with medical writers of that period, as in the older works on materia medica ipecac is frequently referred to as *radix antidysentaria,* indicating its therapeutic application. Prior to the beginning of the nineteenth century ipecac was not employed to any extent as an emetic; its greatest virtues were extolled in the treatment of the various forms of dysentery and "bloody flux," as it was known, and in similar disturbances of the intestinal canal. It it stated that during an endemic outbreak of dysentery in Nimeguen (Holland) in 1727 many thousands of soldiers became afflicted with this serious malady. The army surgeons administered ipecac empirically as a specific, and Geoffroy's report tells us that "in one day whole companies of soldiers afflicted with this most distressing ailment were cured by ipecacuanha like magic."

Ipecac, in conjunction with opium, forms the principal component of the world-famous Dover's powder, and both drugs share equal rights in the therapeutic fame of this galenic preparation. The inventor of this widely used remedy, Thomas Dover, was born in Barton-on-the-Heath, England, in 1660. He studied under the renowned Thomas Sydenham and obtained his medical degree at Cambridge in 1687. In 1708 he fitted out an expedition to the South Seas, accompanying the ship's crew as their surgeon. It is stated that in 1709 he discovered a sailor by the name of Alexander Selkirk, marooned for four years on Juan Fernandez Island. Selkirk returned with Dover to England, and it is supposed that he is the original of Daniel Defoe's Robinson Crusoe. Dover finally settled in England and assumed the practice of medicine in Bristol in 1711. In 1762 was published his famous work, "Ancient Physician's Legacy to His Country," which among many other interesting material contains the formula of his diaphoretic powder. The chapter on gout contains the recipe in the following words: "Take opium, 1 ounce; saltpeter and tartar vitriolated, each 4 ounces; liquorice, 1 ounce; ipecacuanha, 1 ounce. Put the saltpeter and tartar into a red-hot mortar, stirring till they have done flaming. Then powder very fine. After that, slice in your opium; grind to a powder, and mix."

The botanical source of ipecac was the subject of much dispute until finally settled by Gomez, a physician of the Portuguese navy, who brought an authentic specimen from Brazil to Lisbon in the year 1800.

The chief alkaloids of ipecac are emetin, cephaëlin and psychotoin, but it is only of emetin that the pharmacologic action is definitely known. Emetin was discovered in 1835 by that great French pharmaceutical chemist, Joseph Pelletier, in conjunction with Magendie. To Pelletier chemistry and medicine owe the isolation of not a few of the most important alkaloids, *i.e.* strychnin, brucin, quinin, pelletierin, thebain, narcein, etc. Alkaloidal chemistry saw its birth in 1805, with the discovery of the alkaloid morphin by the German apothecary, Sertuerner of Hanover. Emetin belongs to a class of substances which possess specific etiotropic action against diseases caused by protozoa, *e.g.* quinin is employed against the causative agents of malaria, emetin against the diseases caused by amœbas, and certain arsenic and antimony compounds against syphilis and infections with trypanosomes.

In 1875 Loesch found amœbas in the stools of dysenteric patients, but did not regard them as a cause of the disease. Finally, in 1896, Kartulis apparently settled the question by stating that dysentery and tropical liver abscess associated with dysentery were caused by the presence of the amœba coli.

While ipecac has been lauded again and again in the treatment of this disease, especially in more modern times by Dock, Manson, and others, it was left to Vedder to show that emetin would kill the endamœba *in vitro*. The chain of evidence was finally closed by Rogers, in 1912, when he demonstrated the specific nature of emetin in patients suffering from endamœbic dysentery.*

When we realize that ever since Riggs of Hartford, in 1867, called especial attention to the treatment of pyorrhea alveolaris, which since has been christened Riggs' disease, the greater majority of those drugs which generically are classified as antiseptics, caustics, and astringents—and incidentally not a few other drugs which in reality have no bearing whatsoever on the subject—have been recommended at one time or another by that vague and humorous phrase, "It is of value in the treatment of pyorrhea," the introduction of emetin as a remedial agent for such purposes must be heralded as an epoch-making step in pathology and therapeutics. The discovery of endamœbas in pyorrheal pus, and the subsequent treatment of this disease with emetin, as recorded by Smith and Barrett, and independently verified by Bass and Johns, and by many other observers, is an attainment of patient scientific investigation which is deserving of the unrestricted praise of the dental and medical professions the world over.

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* In connection with the history of ipecac it is interesting to observe that the record of cinchona bark and its alkaloid, quinin, is an almost complete sequel of the romance of the drug under consideration.

Proceedings of Societies.

Dental Society of the State of New York.

Forty-sixth Annual Meeting.

(Continued from page 215.)

[The postponed report (see Dental Cosmos for February, page 206) of part of the business of the afternoon session of Friday, May 15th—viz, the Report of the Committee on Scientific Research, and its discussion jointly with Dr. Gies' paper—here follows, while Dr. Gies' paper is printed in full at page 276.]

Report of Committee on Scientific Research.

By Dr. W. B. Dunning, Chairman.

Mr. President,—I think it is quite superfluous for me to introduce the gentleman who is to make the address of this afternoon, as he has become our valued friend during the past five years, as well as our honored member. We also are exceedingly fortunate in having with us at this time four eminent investigators capable of discussing this intricate and new subject to be presented by Professor Gies—namely, Dr. Rogers of New York, Dr. McCrudden of Boston, Dr. Price of Cleveland, and Dr. Brown of Milwaukee; and I am sure that the presence of these gentlemen will add materially to the interest of the important subject to be discussed.

As you remember, last year Professor Gies delved into the possible relationship of potassium sulfocyanate to susceptibility and immunity to dental caries, and he stated at that time that, in so far as the laboratory work was concerned, he felt that he had brought the subject to a close. He did, however, make the statement that clinical work would now be in order to establish some facts in regard to the possible effects of the administration of potassium sulfocyanate.

The last time the committee consulted with him in regard to this aspect of the subject, Dr. Gies submitted an outline of what he would consider the correct procedure of such further work, to be carried out either by this society or other investigators. Your committee considers it important to place this upon record, and I shall therefore read his outline at this time:

GENERAL OUTLINE OF PROCEDURE IN A PROPOSED STUDY OF SULFOCYANATE AS A POSSIBLE PROPHYLACTIC FOR DENTAL CARIES. By William J. Gies, Ph.D., Columbia University.

[*I. Explanatory letter, Feb. 4, 1914.*]

Chairman, Research Committee, Dental Society of the State of New York.

Dear Sir,—As I stated to you and your associates, when we conferred here in December, I feel that the proposed study would not be worth while, if it were not based on a plan that would withstand the most searching scientific criticism.

Fully a dozen suitable persons should be selected as subjects, and at least six dentists and as many physicians should be involved in the formal examinations. Twice each of these numbers would be better.

A period of at least a year should be devoted, in the case of each subject, to "control"

examinations, conducted quarterly. The control examinations would establish individual peculiarities beyond any possibility of subsequent confusion of cause with coincidence.

A preliminary conference, between subjects and dentists, should be held about a month before the initial examination of record, for the establishment of necessary standards in both supplies and procedure. Your committee would have to agree upon the selection of standard supplies for the use of both the subjects and the dentists.

It is essential, I think, that saliva for the tests be collected quarterly by the subject in his or her own home, for the removal of psychical influences, and also at a time bearing a definite relation to the last preceding meal for the day, in order to prevent the variations in salivary character that might be due to irregularities in nutrition. More frequent collections of saliva would be desirable.

The proposed salivary examinations are the only ones that seem to bear on the matter in hand. We should be glad to conduct as many such analyses as might be desired of us here in this laboratory.

The estimation, by the dentist at each examination, of probabilities of change in the future condition of the teeth might do much to explain subsequent alterations, if any were noted. The nature of the examinations the dentists should make can be decided by you without any help from me, but my suggestions in this connection may be of some use to you in formulating your own ideas.

The proposed medical examinations should be conducted by the physician, in each case, absolutely independently of those by the dentist, and *vice versa*. The nature of the patient's occupation, and his environment in his occupation, residence, and travels, might explain much in his nutritional condition (and the state of his teeth) that would otherwise be obscure.

The remaining items in the proposed *medical* examination (see Outline herewith; G, 3 to 6) relate to the condition of the teeth, directly or indirectly.

A full report of each dental and medical examination should be forwarded (immediately after the completion of each examination) to the chairman of the Research Committee, so that the data might be recorded in an evolutionary plan for the prompt discovery of any points of significance suggestive of additional features for incorporation into the research. The knowledge that each report would be a closed one and not subject to future revision after further examinations, would make each examiner more judicial in his observations and comment, if that were possible in any case.

The research should be conducted by dentists and physicians in widely separated districts. It would be best to start the work on all subjects on a given date, each series of examinations to be made within a given week on a definite schedule, prepared by the Research Committee and in the possession of all examiners.

It might be very difficult to start this research effectively before your May meeting. At that time co-ordination in plans for, and instructions to, examiners could be effected in oral conferences.

After a year for the establishment of "control," *i.e.* normal, data there should be a year during which each patient would be subjected to sulfocyanate treatment, this year to be followed in turn by a third year under "control" (normal) conditions. My proposals in the outline relate in detail to the work of the first of the proposed three years. Details of sulfocyanate treatment would be the only additions to the plan for the remaining yearly periods, unless the results of the first year's work would require other modifications.

Although most of the suggestions in the accompanying outline need no special explanation, before your committee decides whether you wish to proceed along the lines indicated, I should be glad later, if you desire it, to place, under each item in a copy of the outline, a brief explanatory statement for the benefit of all concerned.

I should be glad to confer with you further on any matter related to this subject.

With kindest regards and best wishes, I am,

Yours cordially,

Wm. J. Gies.

[*II. Outline.*]

Before Treatment with Sulfocyanate.

I. examinations by the dentist.

A. *Conference between dentist and subject about a month prior to the beginning of the formal examinations.*

1. Approved brush and cleansing materials presented to the subject (standard selections).
2. Method commonly used by the subject to brush his (her) teeth (*demonstrated by the subject to the dentist*).
3. Capacity of the subject properly to

brush his (her) teeth *after* special instruction on this point by the dentist (*demonstrated by the subject to the dentist*).

4. Explanation by the dentist, to the subject, of variability in the secretion of saliva and its reasons.
5. Demonstration, in detail *by the dentist*, of the standard method of collecting saliva for use in the chemical tests (materials to be supplied to the subject).
   - .1—Preliminary flushing of mouth with water, with subsequent "resting", period.
   - .2—Chewing of *standard* flavored gum as *uniform stimulant*.
   - .3—Collection of saliva through funnel into bottle in *standard time*.
   - .4—Necessity for preventing evaporation, or admixture with extraneous liquid, explained to the subject.
   - .5—Method of shipment or transportation of saliva to the chemist indicated.
6. Demonstration in detail, *by the subject*, of capacity to follow directions 5.1—5.5, inclusive.

B. *First formal examination.*

7. General condition of the teeth *before* their thorough cleansing by the dentist.
8. General condition of the teeth *after* their thorough cleansing by the dentist (7).
9. Number and position of sound teeth and of fillings.
10. Condition in detail of teeth and fillings individually.
11. Probability of decay, within *estimated* periods, at suspected points in the *teeth*.
12. Probability of deterioration, within *estimated* periods, at suspected points at the edges of *fillings*.
13. Prevailing dental conditions that might tend to favor decay at particular points.
14. *Special* oral conditions and influences that may be noted, whether they appear to relate to decay or not.
15. Condition of other parts of the mouth:
    - .1—Gums.
    - .2—Tongue.
    - .3—Oral surfaces in general.
    - .4—Throat and nose.
16. Saliva (chemical and mechanical qualities) collected by subject at home at a *given hour* (by standard method—5), following *standard meals* for the *day of examination* and the day before; chemical analysis by standard methods.
    - .1—Volume.
    - .2—Viscosity.
    - .3—Reaction (quant've), both as to acidity & alkalinity.
    - .4—Total solids.
    - .5—Sulfocyanate content.
    - .6—Chlorin content.
    - .7—Fermentation index.

C. *Quarterly re-examinations.*

17. Items 7 to 16 (above) repeated.

II. EXAMINATIONS BY THE PHYSICIAN FOLLOWING, WITHIN A DAY OR TWO, THE EXAMINATIONS BY THE DENTIST.

To be noted at each quarterly re-examination: C to G (3 to 6).

A. Age.
B. Sex.
C. Weight and height.
D. Occupation.
   1. Nature.
   2. Environment.
E. Residence (environment).
F. Extent and duration of travel, if any (within three months).
G. Health at time of, and between, quarterly examinations.
   3. Diseases: any and all kinds observed, acute and chronic.
      - .1—Dates of attacks.
      - .2—Duration.
      - .3—Degree (severity).
      - .4—Medication (nature and duration).
      - .5—Convalescence (duration).
   4. Nutritive condition.
      - .1—Well or poorly nourished.
      - .2—Appetite.
      - .3—Constitution.
        - .01—Muscular equipment.
        - .02—Heart and circulation.
        - .03—Obese.
        - .04—Anemic.
        - .05—Nervous state.
        - .06—Skeleton.

.4—Dyspepsia.
.5—Constipation.
.6—Diarrhea.
.7—Condition of nose, throat, tongue and oral membranes.

5. Features of daily food selection.
.1—Kinds of food usually constituting the meals.
.2—Character of desserts.
.3—Special dietary fondnesses (gratified).
.4—Kind and quantity of food eaten before retiring.

6. Habits affecting appetite and nourishment.

DURING TREATMENT WITH SULFOCYANATE.

I. EXAMINATION BY THE DENTIST.

Items 1, B, 7 to 16 inclusive (above) followed at each quarterly examination.

II. EXAMINATION BY THE PHYSICIAN.

Items II, C–G, 3 to 6 inclusive (above) noted at each quarterly examination.

AFTER THE CONCLUSION OF THE TREATMENT WITH SULFOCYANATE.

I. EXAMINATION BY THE DENTIST.

Items 1, B, 7 to 16 inclusive (above) followed at each quarterly examination.

II. EXAMINATION BY THE PHYSICIAN.

Items II, C–G, 3 to 6 inclusive (above) noted at each quarterly examination.

The Chairman then introduced Prof. WM. J. GIES of Columbia University, who addressed the meeting, his subject being "Studies of Internal Secretions in Their Relation to the Development and Condition of the Teeth."

[This paper is printed in full at page 276 of the present issue of the COSMOS.]

Discussion.

Dr. JOHN ROGERS, New York. It is becoming quite evident that the dentist's responsibility to his patients is steadily increasing. The onset of many chronic disorders is quite frequently first manifested by disease of the teeth, and the dentist must now have some conception of the early symptoms of what may later prove some very troublesome or incurable disease.

Dr. Gies has summarized much of the physiology of the ductless glands, hence I shall confine myself chiefly to the thyroid, which, from its anatomical position and its susceptibility to enlargement as well as its seemingly important relationship to the teeth, should be familiar to every dentist.

Any enlargement of this gland which renders it perceptible to sight or touch represents an abnormality. The best evidence which we have suggests if it does not prove that this increase in size is at bottom not a disease but an attempt of nature to compensate for greater demands on the part of the body for the thyroid secretion than the gland of natural size can supply. It seems probable that some individuals have thyroids which are more capable of functionating than those of others, and when larger amounts of thyroid activity are required than the organ of normal outline can supply, nature has provided that the gland can undergo a compensatory hypertrophy. It is very common to note that, just before or during the period in which these changes become apparent in the neck, the patient has been subjected to more than the usual amount of stress, or, more exactly expressed, to more than the usual amount of fatigue.

The early symptoms of these thyroid disturbances are all those of ordinary fatigue, and throughout all stages of the process there are sensations of nervous and physical weakness, and at the beginning there are generally evidences of more or less deficient functionation in nearly all the organs of the body. At this period, as well as later, it is very common to observe caries of the teeth, and the cause should not be sought locally, but in the constitutional disturbance. An enlarged thyroid is extremely easy to detect, and in its presence suspicion should immediately be aroused.

From a simple compensatory hypertrophy with mild disturbances of nu-

trition, thyroid disorders may advance in any one of three directions; either into the common goiter, which ordinarily means a permanent degenerative change in the organ, with or without other symptoms; or into myxedema; or into the stage of hyperthyroidism and later exophthalmic goiter. If the first compensatory hypertrophy is recognized, and its significance understood, much trouble can generally be prevented, and the dentist has peculiar opportunities in this service.

The pathological physiology involved in these thyroid abnormalities is for the most part unknown, but some recent experiments help to explain part of the symptoms. The thyroid, through the secretion by which alone its function is performed, seems to be intimately concerned with the chemical processes underlying the production and expenditure of energy, hence its apparent relationship with the phenomena of fatigue. Dr. Gies has referred to the experiments of Gudernatsch, who, by feeding thyroid tissue to tadpoles, has caused the animals to metamorphose into complete frogs within a few days; the normal metamorphosis requiring from six to eight weeks. If the tadpoles, on the other hand, are fed only upon thymus gland, they remain always tadpoles. They grow to giant size, but show no attempt to metamorphosis. But if, at any time during this period, the thymus-fed tadpoles are put upon a thyroid diet, their metamorphosis occurs almost at once. They can be changed from tadpoles of any desired size into fully formed frogs. Reversing the way in which they are fed, however, does not make the frog reverse its development; —once a frog, always a frog.

These experiments prove the immense importance of the thyroid in growth and development, particularly in the changes which take place in the metamorphoses of childhood into youth and adolesence, and they help to explain the hypertrophy of the thyroid which is so commonly observed in young people. It appears to be an enlargement of a presumably weak organ to compensate for demands for secretion to promote the nutritional processes incident to growth. During this time caries of the teeth is both common and troublesome, and if associated with goiter or thyroid enlargement the caries may be remediable by appropriate constitutional treatment. The therapeutics which seem indicated in the early stages, by the way, are of a protective and supporting nature, rather than destructive, or surgical removal of the gland.

If the thyroid is enlarged and there are no constitutional symptoms other than fatigue and dental caries, it is perfectly logical to help out the supposedly overworked gland by advising rest and freedom from nervous strain, and at the same time to prescribe thyroid feeding. As ordinarily practiced, this is by no means free from danger. The explanation of these risks involves a discussion of the metabolism of iodin by the thyroid, and is long and involved. It is enough to say that the presumable fatigue of the thyroid, which accompanies its forced activity in supporting an excessive production and expenditure of energy, means a fatigue of its epithelium, which interferes with the production of the thyroid secretion. Iodin seems to be an essential constituent of this secretion, and if the epithelium from which it comes cannot metamorphose iodin, any blood excess of this element produced by feeding it in the form of tablets of thyroid substance (which always contains iodin), or in the form of potassium iodid, must damage the thyroid epithelium. It seems too "tired" to perform its biochemical duties. Clinically, it very often does harm instead of the good one would theoretically expect. In our experiments at the Cornell Medical College we have attempted to overcome these difficulties by employing what seems to be the active principle of the thyroid. We have used the proteins which can be recovered from an aqueous extract of the thyroid, and standarized them according to their iodin content,

and we have also used a liquid which seems to be still nearer to the active principle. Neither of these substances, however, is perfect, but both are much better and safer than the desiccated gland substance.

The investigations in which I have been interested, while as yet inconclusive, strongly suggest that the physiology of the thyroid and other ductless glands involves the relationship of the nerve terminals to each cell and its nearest blood supply. It seems possible that each ductless gland, through its secretion, controls the metabolism in each cell of some inorganic element, and that the secretions overlap, so to speak, in this influence. The thyroid, for example, may control the metabolism of calcium and potassium, while the thymus may control that of calcium and sodium, or of potassium and magnesium, and when either gland fails in its duty the tissues in which these elements are most important show a corresponding failure.

All the evidence we possess seems to indicate that the effects of the thyroid, or more exactly, of its secretion, are exerted upon the terminal filaments of some portions of the sympathetic nervous system; that it has a profound effect upon the nutrition of practically every organ in the body, and—which is not least in importance—upon the nutrition of the teeth.

Dr. Francis H. McCrudden, Boston, Mass. When I began to study bone diseases nearly fifteen years ago, I was greatly hampered by the prevailing view that bone is dead tissue not undergoing metabolism, and made little progress until I recognized that bone is not dead tissue, but alive, and, like other tissue, undergoing a continuous process of resorption of old and apposition of new. Since this conception proved of fundamental importance in our bone studies, and since teeth are very similar in composition and structure to bone, I should like briefly to present the conception:

In the disease known as osteomalacia the bones become soft and fragile as a result of a decrease in calcium salts—a decrease generally held to be the result of the solvent action of acid. Chemical analysis convinced me that this process cannot be a simple decalcification, for there is not only a relative but also an absolute increase in the amount of osteoid tissue and lime salts, and so I was obliged to conclude that new osteoid tissue and magnesium has been laid down. The result of metabolism experiments and of histological examination, too, are in harmony with this view, for experiments in which intake and outgo were determined showed a loss of calcium and a retention of magnesium and of the elements of osteoid tissue, and histological examination showed an abundance of osteoblasts and other evidence of young new tissue in the lime-free bone.

These findings made me examine more closely the whole evidence relating to the nature of bone metabolism, with the result that I was forced to conclude that bone does undergo metabolism. The fact that osteomalacia can be produced artificially under certain conditions by the use of a diet poor in calcium is evidence that the skeleton needs a continuous supply of this element. Further evidence of bone metabolism is seen in the fact that the lamellæ, which are so disposed as best to withstand strains, shift their position as, in the course of life, the weight to be borne and the direction of the strain vary. Evidence of anabolism is seen in the formation and calcification of the callus after fractures, and evidence of catabolism in the loss of calcium salts by the bone in starvation and in the thinning of bone during disuse.

In the light of this conception, it becomes easier to understand the nature of the process in osteomalacia. Old bone is continuously resorbed and new bone laid down just as in health, but the new bone is poor in calcium. The reason of the poverty in lime salts was found to be due to a diversion of the calcium to other uses. In the most common form of osteomalacia, namely, puerperal osteomalacia, the salts are diverted to the

growing fetus and the milk; in the rarer cases, in nulliparæ and in men, some cause of a flux of calcium such as multiple osteomata, heteroplastic bone formation, severe arterio-sclerosis, and bladder stones of calcium oxalate can nearly always be demonstrated, thus bearing out the conception of the etiology.

A flux of calcium once started does not end as soon as the need ceases for over-production. The factor responsible for the continued production of immune bodies after an infection leads to a continuation of the flux for a variable period afterward, and it is this tendency to over-production which makes puerperal osteomalacia the most common form, for the disease occurs in women after several rapidly succeeding pregnancies and long periods of lactation, the flux of calcium continuing from one period of gestation to the next, and finally becoming continuous.

Rickets and dwarfism are forms of disturbed calcium metabolism. Rickets is a disturbance similar to osteomalacia. Dwarfism of one type is due to an inadequate content of the blood in calcium following great losses through the feces; dwarfism of other types is the result of an inabilty to properly utilize calcium for bone growth.

The normal metabolism of bone is analogous to that of muscle—a continuous process of resorption of old and apposition of new. The skeleton acts as a store of calcium, and loses this element when it is needed elsewhere, so that the store in the bones varies with the needs of the rest of the body, just as the subcutaneous store of fat and the glycogen store of the liver. Mild forms of osteomalacia are often seen in skiagraphs of bones supposed to be normal, and examination of the bone in women dying during pregnancy reveals similar changes in nearly all. But bone has a very high factor of safety, and osteomalacia gives rise to symptoms only after a long-continued drain of calcium, especially in persons in whom the degree of over-production is great.

It is to be noted that osteomalacia and allied conditions are not primarily bone diseases, but disturbances of calcium metabolism in which the bone becomes involved—a distinction of importance owing to its possible bearing on dentistry. Any bone or bones, or parts of bones, may be involved. The names rickets, osteomalacia, osteitis deformans, osteoporosis, etc., refer chiefly to localization and distribution of the lesions. In puerperal osteomalacia the pelvic bones are first attacked, the ribs next; in non-puerperal osteomalacia it is more commonly the extremities and ribs; in osteitis deformans, parts of the skull and femur; in severe arterio-sclerosis, parts of the skeleton nearest the most severely sclerosed arteries. In rickets the lesions are found at the junction of the epiphyses and diaphyses and underneath the periosteum; in osteomalacia, in the interior of the bone in proximity to the Haversian canals. As for the teeth, one observer has pointed out that the zone of uncalcified dentin is increased in width in severe cases of rickets, and another observer has noted the same in the spontaneous rickets of rats. As I have already remarked, the incidence of mild forms of osteomalacia is much greater than commonly believed, and this, it seems to me, has a distinct bearing on dentistry. The bones, on the one hand, with their high factor of safety and great protection in the interior of the body, may well be somewhat below par and nevertheless functionate; in the teeth, on the other hand, which are exposed to severe mechanical and chemical violence and have a low normal factor of safety, if judged by the incidence of diseased teeth, any condition like osteomalacia, which still further decreases that factor of safety, must be relatively important.

Calcium metabolism is under the control of certain glands of internal secretion. Removal of the parathyroid leads to mobilization of calcium and to rickets, and the gland has been found affected in osteomalacia. The hypophysis controls directly the metabolism of the epiphysis; hypoplasia of this gland leads to dwarfism; hyperplasia in youth to

giantism, later in life to acromegaly. The form of dwarfism known as cretinism is the result of hypoplasia of the thyroid. Status lymphaticus, a condition of generalized hyperplasia of the lymphadenoid tissue, is accompanied by infantile anatomical peculiarities. The relations of the thymus and pancreas to dwarfism, though less definite, are suggestive.

There is more direct evidence of the control of the calcium metabolism of the teeth by the parathyroids in the studies made in Weichselbaum's laboratory in Vienna. After removal of the parathyroids, the dentin of the gnawing teeth of rats was found poor in calcium. In extending these observations, Toyofuku found not only the dentin but also the enamel affected by the operation, and he observed further that the grinding teeth, which do not grow and wear off like gnawing teeth, are also somewhat affected, if the animals are not too old. If the experiments had been continued longer, perhaps the effect on the latter would have been greater. Still later, Erdmann showed very strikingly how removal of the parathyroids is followed by formation of layers of dentin poor in lime salts, to be succeeded by layers of normal dentin when the transplanted parathyroid again began to functionate.

If studies in bone metabolism throw light on the teeth, dentistry may reciprocate. As Stein pointed out last year in the Dental Cosmos, examination of the localization of the syphilitic hypoplasia of teeth, together with a knowledge of the time of calcification of the teeth in intra-uterine life, enables one to date the onset of the infection at the fourth month of intra-uterine life. Similar studies on congenital forms of dwarfism associated with deformed teeth, and almost certainly disturbances of internal secretions, might be able to give a lead for the study of these conditions.

Dr. W. A. Price, Cleveland, Ohio. The spirit of this hour is one of the most refreshing and encouraging symptoms of dental progress. I want to assure Dr. Gies that the limit of the support of the National Dental Association is the limit of the support of the profession of the State of New York. The National Dental Association, through its Foundation Research Commission, is after the truth. They have no compromise with the man who desires to get royalties to spend on himself, but they are willing to give assistance to him who would rather be shown that he is wrong than that he is right.

In experimenting on animals with a diet which was as nearly calcium-free as we could make it, even to the third decimal, we undertook also to make simultaneous observations of parallel conditions in the human being, studying them from the clinical standpoint. Infants cannot obtain lime salts from the same sources as most animals; for example, rabbits and guinea-pigs can obtain it from lettuce the first day after birth; calves from grass from six weeks to a few months after birth, adult rabbits even from calcium carbonate. Investigations indicate that the human infant can obtain calcium salts only from animal protein for several months after birth, and later from vegetable protein and soluble carbohydrates, and probably much later from insoluble carbohydrates. In our studies of human beings in whose diet we have lowered the calcium content for a time, we selected cases of hypoplasia, and in almost every case in which an accurate history could be secured, the diet had not been normal during the first one or two years of life. The observer was struck immediately by the characteristic markings of the first third of the lower incisors, and the first fourth of the upper incisors in regard to the shape of the teeth and the external structure of both the enamel and dentin. We also found that these markings correspond in different teeth very closely with the developmental periods of these structures. We also came to the conclusion that the markings corresponding with those of Hutchinson's teeth have probably been over-emphasized. In fact, I question whether that symptom is of much value as a diagnostic means in heredi-

tary syphilis, because in many, if not all cases, there is a hypoplasia similar to that observed in patients with a definite history without any syphilitic complication. These hypoplasias nearly always affect not only the enamel but also the dentin. To cite an example: A child, who had been normal for the first few years of life, exhibited an almost normal formation of the enamel of the incisors. Beginning at about three years of age and continuing to about the sixth or seventh year, the child had an increasing complication which finally proved to be a constriction of the cardiac opening into the stomach. There was a continual regurgitation of food, and the child was slowly starving to death during the period when the dentin of the root should have been formed. The treatment of the child was unsuccessful for a period of time, and the condition was finally diagnosed by injecting bismuth subnitrate into the esophagus and stomach. It was found that the food did not enter the stomach but lodged in the esophagus. The condition was rapidly growing worse until an operation was performed, and in a few months the boy was able to swallow and retain food.

The general deductions from these hyperplasias are these: We have found that they are constantly related to imperfect nutrition during the period of the first three years of life, and in almost every case a history of artificial feeding was secured. We found that infants fed on baby foods poor in calcium content or normal proteins and solid carbohydrates, and rich in insoluble carbohydrates, exhibited the characteristic condition of hypoplasia. In fact, this was so marked that we could almost pick out the food that the child was fed upon; this is in accord with the researches made by the Swiss government, which found that those soldiers who had been normally breast-fed could march longer and tolerate greater hardships. In the same manner we found, by compiling cases of all ages for a period of ten years, in people under thirty years of age, about 1 hypoplasia in 75; in people between thirty and sixty years, about 1 in 100, and in people over sixty years, about 1 in 500. We also found that, in several cases, the typical marking was present. In one case particularly, the mother acknowledged that she had deprived the child of breast-feeding so that she might not be bothered with nursing him.

Another point that I wish to speak of is the relationship of the ductless glands, and particularly the hypophysis, to the development of the dental tissues and the dental arch. The case which I shall present is a very unusual one. A boy fifteen and a half years of age presented all the typical symptoms of disordered functional activity of the pituitary body. He had been normal until four years of age, when he became affected with cerebro-spinal meningitis; as a result the development of his maxillary bones was almost the same as that of a child four or five years of age, and the development of the teeth has been abnormal since that time. The fact that the upper arch occluded inside of the lower arch may be a factor which increased the pressure on the pituitary. Regardless of whether it did or not, here is a remarkable feature of this case: When we widened the space between the maxillary bones, and brought the maxillary bones downward and forward to a distance of one-half or three-quarters of an inch, as shown by the skiagraph, immediately the boy's whole physical, mental, and moral condition changed. I wish now to refer for a moment to the separation of the maxillary bones. The left nostril was entirely occluded. A rhinologist had spent half an hour trying to pass moisture through it by the aid of adrenalin. Inside of thirty days, he could pass a lead pencil into the nostril, and the patient was able to hold the mouth closed and breathe through the nostril which originally had been entirely closed.

The boy showed all the characteristic symptoms of a disordered pituitary condition. He was infantile in development at fifteen and a half years of age, about like a child of six or seven years of age, and his reproductive organs were en-

tirely infantile. He kept asking for something to drink, and seemed to be sleepy all the time. The conditions in this case correspond exactly with the findings of Dr. Cushing, who removed the pituitary body in dogs and found that they remained infantile, especially with regard to the reproductive organs. In other words, a puppy from which the pituitary body was removed did not have the reproductive organs develop. The dog became slow in his actions, in the same manner as was observed in the case of this child. When we began treatment the child immediately began to develop mentally to such an extent that he wanted to play with boys near his own age, whereas previously he had played with toys in the same way as a child of five or six years of age. In twelve weeks that boy's reproductive organs went through almost the complete cycle which marks the development from childhood to adolescence. Instead of having for playmates children of five or six years of age, he wanted my lady assistant to go to a dance with him. He lives in another town, and while, before treatment, he had to be taken back and forth, he is now able to go to the train and travel that distance alone. A pathetic feature in this case is that the development of his reproductive organs has been such that the boy has become almost a "bear." His mother and sisters say that he must be sent to a school where there are no women.

The significance of all this is very great. Here is the case of a boy with arrested maxillary development, an interlocked condition of the maxillary bones, and there seems to be no doubt that this condition had much to do with pressure on the pituitary body, because there was an immediate improvement upon widening of the maxillary arch. Is not that also an answer to the question of why children seem to become brighter after orthodontia treatment? When we go deeper into this subject, the question arises as to the relationship of the deposition of the calcium forming the maxillary bones to the obstruction of the pituitary body. Was there, in the case described, any constriction around the infundibulum by the process of skull-tissue formation after the attack of cerebro-spinal meningitis? Whether there was a lack of proper secretion that reduced the organ in size, or whether there was an interference of the intricate functioning of the glands of internal secretion of the pituitary body acting as the center of control of the thyroid and parathyroid glands, we cannot say.

Thus the whole problem brings us back to the question of research. So far as the National Association is concerned, the aim of the commission for this work is to encourage just such work as Dr. Gies has been doing, and at the same time to gather all the data possible and make them available for others doing that work. In other words, in the last analysis the ambition of the commission is to bring about the greatest good to the greatest possible number.

Dr. G. V. I. Brown, Milwaukee, Wis. I have come a long way to hear this report, and will have to go home again in a few minutes, but I would have traveled many times as far to hear the report we have just listened to. It has given me pleasure beyond description, and it will be of inestimable benefit to the community, unless I am much mistaken—because I feel sure that this is but the beginning of the work, and that we will go on until definite results are reached.

Personally I have become tired of reasoning by analogy, of working on an empirical basis—and I think we all have. Unfortunately, once the idea of this ductless gland system gets hold of one, it is almost impossible to get rid of it; it is so insidious that it shakes one's very foundations for reasoning, and one is completely at sea; this, after fifteen years of very active work in one direction, is my own personal position. The real value of this report, as I understand it, lies in its all-embracing character. It reaches every point, every center, every interest with which we have to deal, and it wipes out once and for all every line of distinction between the various branches of the medical profession. There can be no longer any such

distinction once the purport of these secretions is understood, even in so far as we now comprehend them.

Whichever one of these particular glands is involved, we note, in a certain measure at least, certain physical indications which are similar to those due to the other glands, and the investigation of the relationship of these glands to each other is now our most difficult problem. There is no question that in this functional balance there is a correlation of these glands which is essential to the perfect working of the whole, and some writers have claimed that there are certain definite characteristics not only of each of the glands themselves, but of different part of these glands, as for example in the posterior and anterior lobes of the pituitary. We know from experiment that by the use of extracts and removal of portions of these glands, certain more or less definite results are obtained. We note some of these effects following castration. We note, in some cases, hyperthyroidism, or other diseases and affections of other ductless glands, and it is for that reason above all others that there is greater necessity for beginning on a solid foundation such as has been laid for us today with great patience.

I admire Dr. Gies' patience in making this clear to us almost as much as I admire his scientific knowledge. With great patience and profound understanding he has laid a foundation upon which we can build a structure which, if we do not allow ourselves to be carried away with over-enthusiasm in regard to any results we have obtained, will some day be the controlling structure in the science of medicine.

I want to speak for just a moment of the clinical demand for this knowledge. Only the other day, in one of our large cities, I was taken into a hospital and found a young girl lying with a twenty-five-pound weight on her feet, being treated for extension of the hip. There was a shortening of two inches, and an endeavor was being made to effect an extension by mechanical means; the physician said that, curiously, there was no lesion in the hip which the X ray would show, and that there had not been any destruction or any suppuration. I asked him if he had ever looked at the back, and he said, "No." I had the girl sit up, and she exhibited the shoulderblade characteristic for all these cases, also the peculiar development of the feet and ankles, and, of course, a narrow contracted arch, with narrow nares and mouth-breathing. There was a complete picture, quite similar to some of the cases shown by me last year, of unequal development of the halves of the body. In this case, first of all, a knowledge was needed of the underlying factors responsible for the ill-development. This child's parents were lavishing every effort to bring her back to nervous stability; her case was not so bad as that of cretinism described, but the clinical picture is somewhat similar. I have among my patients a child who is developing apparently normally, but whose speech center is not active; she does not try to talk. There is no doubt about such nervous instability in this case; the child is looked upon as being defective. Now, with the present light on these matters and the scientific stimulus in this field, there is hope that in the future we shall far exceed our present curative resources.

In one of the cases we showed last year, one of dementia precox, it seemed difficult to say whether that case could be treated, but today the man is well. He has been restored to his family, has had a child born, and is apparently well. The picture of these cases is the picture of other less serious cases. Then there is that other type of extreme nervousness and excitability, the wasting of muscular and other tissue, and no doubt bone as well. In our experiments on dogs, we produced the same general symptoms, and we had difficulty in keeping them alive longer than six months, because of their susceptibility to infection. In these dogs, showing evidences of disordered pituitary glands, we expected to find microscopic changes in the pituitaries which we would be able to recognize, but, when we went to examine them,

we found that we did not know what the normal pituitary was. We had no standard to go by. All this presents to us a large and unsettled problem which will have to be worked out by experimentation, and I hope that I may live to see the final result of what today's transactions are the beginning; if I do, I shall have lived to see the end of most ills to which mankind is heir.

Dr. L. M. Waugh, New York. I do not believe that, in my professional career, I have more enjoyed two hours than those just past. It seems that all the disappointment which one sometimes experiences when reflecting that he has gotten into an occupation which is dominated merely by the mechanical and not based upon an underlying knowledge of science is removed by just such experiences, which inspire one with the hope of something that is yet going to be sufficient to satisfy the life-work of the man who is ambitious from the broader standpoint.

I shall not attempt to discuss the paper, although I have been attracted by the important problems concerning tooth calcification and bone development in the structures of the jaws and face. I can only sit in admiration and calm satisfaction over the advancement that is promised to us. The fact that eminent scientists in the forefront of research have been willing to come before us dentists and give the best of their knowledge, it would seem, promises something for which I have yearned ever since I have been engaged in dental practice. The beneficent possibilities of our work seem as far-reaching as those of any other branch of the healing art. In taking up a single part of our work as a specialty, I have been guided by the feeling that concentration offers the possibility of scientific work by the application of just such bigger thoughts as we have heard today. In orthodontia, it seemed, there were greater possibilities for the application of these principles than in any other branch of dentistry, but today I am awakened to their important bearing upon all phases of dentistry.

Dr. Price told us about the wonderful results following the removal of pressure upon the pituitary body which had caused the arrest of growth in that tiny gland, with resulting malocclusion. That particular case furnishes another evidence of the fact that in too many instances we have been blindly treating the symptom and not the cause. Also, in acromegaly and many other perversions, the application of these enlightening researches promises great possibilities for the improvement of oral function. When Dr. Brown said that the application of these scientific principles to mouth conditions would tend to obliterate any line of demarcation that might separate certain branches of the healing art, I believe he stated a truth and augured a most desirable relationship which will result in better professional service.

This is most gratifying to me, as it must be to all who have embraced the privilege of aiding in this research movement. You and I cannot possibly do valuable scientific investigation and at the same time attend to a supporting practice. Therefore I have experienced great comfort in contributing my mite in money toward the employment of those who have, by special training, been prepared for research and who are giving their entire time and best energies to it. As each new discovery shall be established and given to us as a guide for better practice, I shall feel the utmost gratification in the fact that, having supported the work in a material way, I am morally entitled to the newer and better knowledge which this research may give to dentistry and to our patients.

Dr. E. S. Davenport, New York. I wish to say a word of recognition of the value to the profession of this research work—which is, I believe, but just beginning. There are few dentists who are educated sufficiently to take an active part in the accomplishment of work of this character. We are all interested and will be more and more so, I am sure, in the development of this work, but most of us are unable to con-

tribute very largely to its scientific progress. There are men, as we have seen this afternoon, who are able, trained investigators, giving their lives to original research, and to them we must entrust the continuation of this valuable work.

While we are individually anxious and willing to contribute to the extent of our ability to the funds which are so essential, it seems to me we should not depend upon ourselves alone for the necessary money, but should each try to interest one or more patients of wealth in this splendid cause. We all have patients more or less philanthropically inclined who would consider it a privilege to contribute to so important an object, and my desire is to call your attention to that phase of the situation. A number of years ago the late Benjamin Lord, one of New York City's best dentists, so interested his patients that the New York Institute of Stomatology was able to establish a research department under the supervision of Prof. Wm. J. Gies of Columbia University, and that department has been continued and financed by the so-called "Lord fund," largely formed by the contributions of Dr. Lord's patients.

Dr. Gies (closing the discussion). It has been a very great pleasure to listen to this enthusiastic discussion, in which the principle underlying our plan of research has been indorsed with unanimity, and in which so many facts of intimate and suggestive relationship have been presented. I came here with some of the emotions of a missionary to the Fiji Islands—with abounding confidence in the saving grace of our gospel, but with nervous fear of seeing my finish in the soup! Instead of an end of our ministry, there are cordial intimations to make the sermons louder, longer, and more learned. I am sure it is confidence in the *potentialities* of our profession of faith—confidence in the promise of a heavenly dental hereafter through continuance in such research—that accounts for the optimism of this earnest discussion and the cordiality of this audience toward each speaker.

We shall proceed with every hope that devoted application to the study of our many problems will afford results of lasting and material benefit. It will be a great stimulus to earnest endeavor to anticipate the enjoyment of future occasions of this happy and instructive character.

Dr. Dunning. I move that a vote of thanks expressed by a rising vote be extended to Dr. Gies, and to the gentlemen who have taken part in this very interesting discussion.

The motion was carried.

The next annual meeting of the society will be held in Albany, on the second Thursday in May 1915.

EASTERN ASSOCIATION OF GRADUATES OF THE ANGLE SCHOOL OF ORTHODONTIA.

Fall Meeting—New York, November 28, 1914.

THE fall meeting of the Eastern Association of the Graduates of the Angle School of Orthodontia was called to order in the Great Northern Hotel, New York, N. Y., by the president, Dr. A. W. Crosby, New London, Conn., at 9 o'clock Saturday evening, November 28, 1914.

Dr. Crosby introduced as the speaker of the evening Dr. V. E. SORAPURE, New York City, who read a paper entitled "A Note on the Treatment of Habit Spasms."

[This paper is printed in full at page 266 of the present issue of the COSMOS.]

Discussion.

Dr. F. L. STANTON, New York. The essayist's paper seems to me to be a very important one. I can state from experience that respiratory exercises seem to help children to overcome the habit of spasmodic mouth movements. I would like, however, to ask Dr. Sorapure if it is not possible in giving exercises to adhere too strongly to abdominal breathing—because it does seem to me to be quite important to lay stress on thoracic breathing. Is it good policy to teach only abdominal breathing? In the children whom we saw this afternoon there is no question as to their having round shoulders, narrow chests, etc. All these symptoms would be more or less constant in such patients; why, therefore, stop with abdominal breathing?

Dr. SORAPURE. The question is interesting, and has not been overlooked. Our object in these cases is relaxation. Thoracic breathing is, of course, necessary and invaluable in exercises, but here we want complete relaxation, and we can procure this best by abdominal breathing. You know that in sleep the breathing is hardly perceptible; there is no muscular effort whatever, and only the diaphragm moves. Altogether, we get an effect approaching sleep where every muscle is relaxed—that is the object of this exercise.

In regard to thoracic breathing, we have not used it as Dr. Stanton has outlined exactly, although I think we should combine the two, and I shall try some experiments along that line. What we do is to give exercises for thoracic breathing. The average individual is not apt to do that, and it is not, on the whole, the best form of breathing, because it does not reach all of the lungs; but, in order to deepen the chest, improve the condition of the scapula, etc., we teach active exercises, holding up the hands this way [demonstrating], extending the arms, etc., improving the condition of the thorax, and keeping down the tendency to a return of the tics.

Dr. H. C. FERRIS, New York. In cases of stuttering, where the subject is able to read plainly when alone for an hour or two at a time, but in the presence of a third party or under any little stimulation stutters tremendously, how does this treatment apply? Or how do we explain that condition?

Dr. SORAPURE. Those conditions are more or less explained in the fact that, when the patient is reading, he rarely produces his own ideas, pauses when he thinks, and speaks during expiration. We all speak during expiration. We must fill our lungs with air and, as the air is expelled, we produce speech. In pausing to think, one is apt to get incoordinate action if one attempts to speak

during inspiration. By prolonging the breathing I think we tend to overcome this tendency. I have had many cases of this character come into the clinic. I recall the case of a little girl who, when she came to the clinic, could not tell her own name and address or the name of any member of her family, but upon being shown the trick of holding the breath and using the expiratory stage for conversation, she could tell in half an hour the names of her whole family.

Dr. C. A. Hawley, Washington, D. C. It is very difficult to discuss this paper practically without some experience in the method described, but the essayist's deductions are extremely interesting and reasonable, and in accordance with many facts which have been well known. The essayist says that this treatment involves some elements of a psychic nature, and we remember that the East Indians, who are adepts in psychic states, cite as one of their fundamental conditions the control of breathing, and insist upon deep breathing before any of these psychic states can be induced. The control of habits seems to involve something of that nature that needs to be controlled. While, as the essayist says, his treatment has been likened to hypnotism, although it includes nothing of that element, yet it seems to approach that form of treatment which developed out of hypnotism and is called "suggestive" therapeutics. Years ago the men who attempted to control disease and habits by hypnotism found that hypnotism as generally known was not necessary, but that merely a condition of passiveness was required. Instead of making the patient's will absolutely non-existent, the object was to control his will. The procedure, as I understood it, consisted in placing the patient in somewhat the same condition as this treatment does, viz. laying him in a prone position, completely passive, with every muscle of the body passive, yet so that the mind be not vacant, but endeavoring to follow the suggestions of the operator. Under these conditions, I think it is a fact well established in medicine that great results, the actual control of the functions of the body, have been accomplished, and it seems especially reasonable that habits could be controlled in a similar manner. Hypnotic treatment has fallen into disuse, I presume largely because of the time it requires and because of all the difficult preparations that are needed. For instance, the room must be completely quiet all the time to induce that passive state. I understand that the biography of the leader of Christian science shows that she, at one time, was an earnest student of suggestive therapeutics, and perhaps acquired in that work something of the technique—and we all agree that some wonderful results have been obtained.

Another method has been used, and I think is being used today for controlling habits of children by talking to them in their sleep. It is claimed that if one goes to the bedside of a child who is asleep and talks to him very quietly, being careful not to waken him, certain habits, certain dispositions of the mind can absolutely be controlled by that means, without any conscious knowledge of the child. Dr. Thomson J. Hudson, in some of his work which has attracted considerable attention, has made special note of that fact. His explanation is that we are dealing with the subconscious mind of the child, and not with the conscious mind at all. All these facts, it appears to me, strengthen the statements which have been made this evening, and show the reasonableness of the method. This treatment, it seems, has the greatest success if it is administrated by an operator who controls all favorable conditions, viz, a quiet room, quiet surroundings, etc. It is a fact recognized in medicine that it is very difficult to dissociate the psychic element of a remedy from its real physical effect. Physicians frequently accomplish results through psychic methods. They give a medicine which they know will have no therapeutic effect, but depend upon that as a sort of carrier of the psychic effect which possibly aids the patient appreciably. I have certainly heard of no

other development of this method which gives better promise of the control of these habits.

Dr. R. W. Strang, Bridgeport. The thought comes to me, How many of these habits which we orthodontists have to deal with are "spasm habits"?—in other words, are habits such as to be amenable to the treatment which the essayist suggests as being successful for spasm habits? Will the essayist define a spasm habit for us?

Dr. Sorapure. Any habit which is persisted in becomes a spasm habit. A mouth habit which is acquired by imitation, or is the result of an irritating tooth, or a tubercular gland in the neck, or probably some thickening around some nerve passing through a foramen; any impression that lasts sufficiently long to increase the conductivity of the nerve, to increase the irritability and the readiness to response—any spasmodic contractions which become habitual we call spasm habits. It is one of those loose terms that include a dozen or more different phenomena.

Dr. Strang. We are, then, dealing with spasm habits. I am much impressed by Dr. Sorapure's statement that the child does not know that he has a habit. We have all had difficulty in inducing *parents* to admit that their child has certain habits, but I did not realize that the child himself was so unconscious of the habit. Therefore I have made one mistake in dealing with these habits by telling the child to stop his habit without first carefully showing him what the habit is, and just what muscular movements will counteract it. In such an analysis and synthesis as the essayist suggests I can see a ray of hope for obtaining control of a bad habit, and I am thankful to the doctor for his suggestion, for I believe that it is a reasonable basis upon which to build more successful treatment.

Dr. A. P. Rogers, Boston, Mass. I have enjoyed this evening's paper very much. This subject has for a long time been an interesting one to me. I have tried to observe children closely in an effort to determine the basis of certain habits. I would like the essayist to explain to us what he understands to be the mental basis for habits. My observation has been that frequently a feeling of embarrassment in children of certain types will produce unfavorable habits. I have in mind a little girl who, on the slightest occasion of embarrassment, will bite her lip. Other forms of habits are noticeable under similar conditions; for instance, a little boy who, under slight embarrassment, will hold his tongue between his teeth and against one of his cheeks. Studious children, contrary to our conception, are frequently observed to hold their mouths open to a greater extent than some who are not so studious. I know of one young boy of fourteen years, who, while at mental work, persists in keeping his mouth open. Therefore I would like to hear something in regard to the mental state in its relation to this form of muscular habit.

Dr. Sorapure. It is difficult to suggest any explanation, because there are so many reasons that may explain this habit. One may think that originally it is probably due to some temporary reflex irritation. Of course, one has to fall back on the old explanation that, if a nerve or a particular nerve root has been subjected to any form of irritation, its conductivity is increased, and the damage is done. We have all observed the habit of children, when trying to write, of following the movements of the pen with the tongue, and very often we find cases which may be traced to carious teeth. The sharp edge of a tooth will drive the tongue to the other side of the mouth, and we find a tendency to this movement when the child is embarrassed. In other words, if the influence of the traveling of the motor impulse from the arm center to the face center, and in particular of the carious tooth driving the tongue to the opposite side, is kept up for a month or so, the tongue will involuntarily pursue that particular course. Probably other explanations may come to mind later, but that is the only one that occurs to me at this moment.

Dr. F. T. Murlless, Jr., Hartford, Conn. Recently a young girl, fifteen years of age, came to me, who in most respects was a rather unusual child—very bright and capable, but who had the habit of sucking her finger. There seemed to be no particular predilection as to which finger, but she had indulged in this habit so frequently and persistently that really a very bad facial deformity resulted. The problem of directing the teeth into proper position was not a specially hard one, but the grave difficulty in this case lay in the habit. I found, in talking about this case to the family, that there had been occasions on which members of the family had remained in the room with the child for several nights while she slept, and had stayed awake, in the effort to keep the child's fingers out of her mouth. This made the child wakeful, and without doubt only served to fasten the habit. I would like to ask the essayist if there is any hope of overcoming this habit, and how?

Dr. Sorapure. I feel sure that there is hope in that direction. Occasionally a child who can be reasoned with and shown that the habit is harmful can overcome such a habit. The first measure consists in directing attention to the habit. Very often such a habit is unconsciously indulged in; moreover the child might derive a great deal of satisfaction from it. In this case, I think, the child should be submitted to a trustworthy psycho-analyst. This case seems to be one in which there is an undoubted sexual basis, and a careful psycho-analysis should reveal the cause and point the way to treatment. Some of these habits we may help in overcoming by appealing to the pride of the child.

Dr. Murlless. I was surprised to see that this child's pride seemed to have nothing to do with her habit.

Dr. H. E. Kelsey, Baltimore, Md. I was much gratified by what I saw this afternoon and what I heard this evening, and it brought to mind many individual cases which have perplexed me in the past, and one in particular, which has come to me recently with a very serious open bite in front. When I asked the child, in the presence of her mother, whether she had a habit of forcing the tongue between her teeth, the mother answered in the negative and the child in the affirmative in almost the same breath. This was a case where the child recognized the habit, and I found that when a few months ago she discontinued the habit of thumb-sucking, this habit of forcing the tongue between the teeth was immediately adopted as a substitute and was having a worse effect on the arches than the original habit, though the child had no idea thereof.

Now, it has occurred to me that common sense is a large factor in the method pursued by these two gentlemen, their idea being not to induce the child to undertake to overcome the most difficult thing first, namely, the well-established habit, but to teach it how to first gain control of the whole body through proper breathing and relaxation of all the muscles, including, of course, those associated with the habit spasm. The custom of nagging at children for the purpose of stopping a habit seems to me like beginning at the wrong end, and has probably been one fault of our treatment of such cases. This method we have seen tonight seems to begin the other way; it teaches the child how to get almost complete control of his various muscles and of all the muscles, and then gradually brings him to the state where he can combat this very troublesome condition. This feature has impressed me more than anything else I saw, and I feel that we can apply it favorably in a great many cases that have perplexed us in the past. If it is possible for us to learn to apply this treatment ourselves, I think it would be of great benefit, in the absence of anyone else who would do it for us; but I really think that it could be better done by a specialist.

Dr. Rogers. I would like to ask where we can find literature on this subject? Have any articles on it been published in the medical journals?

Dr. Sorapure. The literature on this

subject is not easily found. I have published one paper, I think last year, and a great many dissertations on this subject are scattered throughout the literature, appearing here and there, but I cannot say offhand where to put one's hands on anything at the present time. I had intended looking up some of the literature before presenting my paper, but did not have the time to do so.

Dr. GROSSMAN. Speaking of the question of the consciousness of the habit in these children, in two of the cases which I showed this afternoon, and particularly in the second case, there was distinct evidence of the child having bitten the lip continuously, and still you heard the child say that she had no such habit. This shows that this habit was subconscious, that the child did not know that she had it, and that attention must be called thereto, otherwise one cannot expect to correct it.

Dr. MURLLESS. I move that a rising vote of thanks be extended to Drs. Sorapure and Grossman for their attendance this evening, and for the clinic this afternoon. (Motion carried.)

Following the paper by Dr. Sorapure, Dr. F. T. MURLLESS, Jr., read a paper entitled "Cervical Adenitis as a Complication in Treatment."

Motion was then made and carried to adjourn.

PENNSYLVANIA STATE DENTAL SOCIETY.

Forty-sixth Annual Meeting, Philadelphia, June 30, July 1 and 2, 1914.

(Continued from page 205.)

THURSDAY—*Morning Session.*

The meeting was called to order Thursday morning, July 2d, at 9.30 o'clock, by the president, Dr. Seip.

The first order of business for the morning session was the report of the Necrology Committee, by Dr. WM. H. TRUEMAN, chairman, on the deaths of Dr. John W. Moffitt and Dr. Frederick W. Amend, Jr.

[Obituary notices of Dr. Moffitt and Dr. Amend have appeared in the DENTAL COSMOS, at pp. 641 and 393, respectively, of vol. lvi, 1914.]

The next order of business was the reading of a paper by Dr. THOMAS P. HINMAN, Atlanta, Ga., entitled "Technique for Some of the Problems in Casting."

[This paper is printed in full at page 241 of the present issue of the COSMOS.]

Discussion.

Dr. DUDLEY GUILFORD, Philadelphia. I have had much pleasure in listening to this paper, in which the essayist shows a great deal of thought and experience. I do not wish to take exception to what has been presented, but every practitioner has his preferences in the matter of methods, and in discussing a paper it is more profitable to bring out different methods.

Dr. Hinman is an advocate of the burnished or swaged gold matrix in casting. This is a good method used by many operators, but personally I have seldom found occasion to use it. It is true that the gold matrix often gives a better fit in mesio-occluso-distal inlays than the usual method, and I have been interested to know just why that is. To my mind it cannot be due to any controlling influence of this thin gold matrix upon the contracting of the gold;

it is too thin for that. Dr. Hinman believes that the matrix overcomes the contraction. My opinion is that, in burnishing or swaging the matrix over the cavity surface, invariably a certain amount of spring is produced, therefore it is impossible to burnish the matrix so that it will fit tightly. That little spring allows for the contraction of the gold and produces a better fitting mesio-occluso-distal inlay. I much prefer to make a wax model on the tooth, because I am sure then that the margins are absolutely correct. My method consists in making a wax pattern in the cavity, and then with a burnisher pressing slightly on the occlusal surface. This spreads the wax a little; afterward I reburnish the margins with a warm burnisher. The result is that the interior of the cavity is slightly enlarged, while the margins are exact. When this wax model is cast, if the casting is done properly, the inlay will go to place every time.

I agree with the essayist that a great deal depends on the technique of casting. In the first place, I like to use a double investment, as that has a great deal to do with the accuracy of the result. I use Dr. Lane's investment over the wax model, carefully excluding air-bubbles so as to secure a smooth surface, and over that I use a hard investment made from red birdsand and plaster, one part of plaster to two parts of red birdsand. I find that this investment will stand almost any heat without cracking. As soon as the investment has set, I heat it rapidly; this to my mind is an important point. As soon as it stops smoking I make the casting, using a centrifugal machine. Care should be taken not to overheat the mold, as I find that five minutes' more heating than is necessary makes a difference in the result. I believe that much of the trouble experienced is due to overheating of the mold.

Another point of importance in casting in a green mold is, never to allow the mold to stand overnight, but always to cast in a few hours. I believe also in the centrifugal machine, as there is less washing away of the mold than in other machines, for the reason that the centrifugal machine starts gradually and the gold flows very slowly in the beginning into the cavity until it is full; then, as the machine increases its speed, pressure is exerted and the gold is driven home, so that there is not much washing away of the sharp edges.

Dr. Hinman's method of making a hood attachment is interesting and useful. His method of making attachments for bicuspids is also very good, but I have found the Carmichael crown to be most satisfactory. In that preparation the tooth is cut rather less than Dr. Hinman suggests. The preparation of the tooth for this attachment is no doubt familiar to most of you. It consists in cutting a groove mesio-distally across the occlusal surface of the bicuspid and extending this groove up to the gingival line on both the mesial and distal surfaces. When this has been done, the lingual portion of the tooth is "coned," so that the wax pattern will draw, and the finished attachment will go to place without leaving a space at the neck of the tooth. The wax pattern for the crown is then made, and I will outline to you a method by which this can be done very quickly. A strip of thirty-six gage copper or phosphor bronze is bent around the tooth, and the ends are held together with the fingers, so that there will be a space of about 1/32 or 1/16 of an inch between the band and the tooth. Then a piece of wax is mounted on the end of a probe and heated rather rapidly, for the purpose of having the exterior of the wax quite soft, while the interior is fairly hard. While the matrix is being held around the tooth, this piece of wax is put in place and forced between the band and the tooth by pressing it home. By this method I can make a Carmichael crown in wax in a short time. Usually the tooth preparation and the making of the wax pattern requires less than an hour. I proceed with this pattern in the same manner as with mesio-occluso-distal inlays, that is, I spread it with slight pressure on the occlusal portion and

then burnish the margins, and I have no trouble in making the casting go to place. I find that I can obtain results in this way, and I simply wish to present this method as an alternative of that presented by Dr. Hinman.

I think the essayist's conception in regard to restoring the natural size of the root-end is excellent. We see many cases of recession caused by food packing into the interproximal space due to the fact that the restoration has not been properly made, and we can make a better-looking crown by this method. The essayist's method of casting the cusp for hollow metal crowns is very good, but not particularly new.

In every way the paper is an excellent one, and it has given me great pleasure to hear it.

Dr. C. S. Van Horn, Bloomsburg. It has been said that the highest compliment that can be paid an essayist is to disagree with him. After a careful perusal of his paper, I find that I can pay Dr. Hinman that high compliment.

In a series of papers, which were published in the Dental Cosmos, I have given the profession a technique for casting which is rational in that it fully considers fixed conditions and takes advantage of the physical effect of heat upon the materials with which we have to work. In that series of papers, the impression and model method was discarded, for the reason that—"A perfect impression demands that all lines of draft be at least parallel, no undercuts being permissible, and that the impression be withdrawn without the slightest rocking in any direction. The greatest diameter of the crown of molars and bicuspids is through the horizontal plane at or near the contact point, and this means that all exterior walls of the tooth have a more or less pronounced tendency toward the spheroidal in form. The taking of an impression of the interior of an approximo-occlusal or mesio-occluso-distal cavity and the exterior of the affected tooth involves a series of procedures not consistent, as a universal practice, with either conservative dentistry or mechanical principles; for, in many cases, one of two things must occur: Either a sacrifice of tooth structure is made in order to eliminate the natural undercuts, or else the impression is distorted when being forced over the bulge of the tooth. This distortion may perhaps be slight, yet the concrete fact remains that a discrepancy occurred, and that whenever such a condition does occur, it will be in proportion to the extent to which the natural protrusions obtrude upon the line of draft."

It was further pointed out that impression compounds are just as susceptible to the physical effect of heat as are pattern waxes. Hence an impression of a tooth cavity will not be of the same size at room temperature as when it is in the mouth—unless the room temperature be the same as body temperature. Therefore, a casting of the same size as the impression of the cavity at normal body temperature demands an expansion of the impression by having it at a temperature sufficiently above normal body temperature, when the model material is being built in and hardening, to compensate for the uncontrollable shrinkage in the gold.

The essayist says: "It is essential that the margins, at least, of all gold inlays be made of pure gold." To this end he swages or burnishes a .003″ pure gold matrix on the model, trimming the matrix to overlap the cavity margins about 1.32″, and casting, after investment, into this gold matrix. One superiority claimed by the essayist follows: "Another decided advantage is gained because the matrix into which the alloy is cast seems to prevent, to a considerable degree, the *shrinkage that is so apparent in the ordinary casting.*"

We feel that Dr. Hinman is deceiving himself respecting the value of the gold matrix. The reason why a .003″ gold matrix has no effect upon the shrinkage of the mass is that pure gold, alloyed gold, or gold-platinum, when in a state for casting, is in a liquid condition, which means that it is many degrees above the normal fusing-point. When this superheated gold comes in contact with that thin film of lining, it—the

matrix—is fused to the mass. Hence, when the cooling stage begins, the casting as a whole—matrix and alloyed gold—shrinks as a mass in precisely the same manner and to the same extent as though no matrix had been used. If the matrix and the cast gold did not fuse together, there would be no union between the two, and the gold matrix could easily be stripped from the casting. The 1/32″ overlap is a very bad feature for the reason that it makes burnishing to the margins an impossibility, and furthermore, the finishing at the cervix in those cases which extend far beneath the free margin of the gum tissue is attended with great uncertainty, and possibly irreparable injury to the gum tissue and pericemental membrane.

If it is desirable that a gold inlay have greater strength than 24-karat, we use iridio-platinum wire, either square, round, or half-round, bent to the desired shape, coated with pattern wax, place it in the cavity, and form the pattern over it. When the casting is completed, we have a 24-karat gold inlay reinforced with iridio-platinum, a structure similar to reinforced concrete.

If there is any one branch of dentistry in which casting reigns supreme, it is crown work, because by using the so-called all-porcelain crown in conjunction with a cast cope, we are nearing the ideal in that we eliminate the ill-fitting band, and at least approach continuity. But since this form of crown is not mentioned in the essayist's paper, we are forced reluctantly to pass it.

While it is true that a large proportion of the bands which encircle roots are ill-fitting, nevertheless they are frequently necessary as abutments in bridge work.

When a banded crown with a Steele's facing is indicated, our technique is slightly different from that described by the essayist, in that the facing and backing are ground to alinement, and the backing is soldered to the projecting end of the post; pattern wax is flowed where desired, carved, polished, invested, and cast. Tacking the backing to the projecting end of the post produces a rigid skeleton, and greatly facilitates the operation. It is to be noted, in passing, that we do all work, wherever possible, directly in the mouth, objecting to all unnecessary transfers to models.

We object to the practice of crowning vital teeth, and especially so when used as abutments for bridges. First, because a large percentage of the pulps subsequently die, and secondly, because a proper preparation of the root can rarely be effected.

Several years ago, in the DENTAL COSMOS, we described a crown useful at times. It may perhaps be of some interest to note the various steps in the construction of that crown, as is clearly shown in these specimens. [Passing specimens.] Another crown I have found use for as a bridge abutment, and one which eliminates insult to the gum tissue in that it is bandless, is shown in this specimen, in which a Steele's facing and the casting process have been used. When we use hoods at all, which is rarely, we cast them from a wax pattern, and if extra strength be desired, iridio-platinum bars are used as previously described for inlays. We never have used a hood or any other form of abutment for a dummy which is attached to but one side in cases of normal occlusion, for the reason that the force of occlusion will throw the dummy out of alinement, usually doing considerable injury to the gum tissue.

From our point of view, Goslee teeth are rarely indicated in bridge work. Their so-called strong feature, which is their inherent strength, is their real weakness. Their strength is secured through the bulk of porcelain, but as the porcelain mass is increased, the bulk of metal in our bridge skeleton must be decreased. We have yet to see a bridge made up of Goslee teeth which did not show a lamentable weakness in the approximal attachments, the triangular bit of metal at that point being insufficient to support the strain imposed.

While a full review of the essayist's paper is not possible in the time allotted, we submit this brief discussion of the more prominent features, for the sole

purpose of endeavoring to stimulate thought and direct activities along lines of least resistance, to the end that in all our work we give due consideration to fundamental principles.

Dr. Wm. W. Booth, Pittsburgh. Dr. Hinman's paper covers a great many of the difficulties arising in the making of inlays, crowns, and bridge attachments which undoubtedly arise in casting, and describes well the advantage of using a swaged lining. I am confident, however, that some of the difficulties encountered with inlays not going to place after being cast are due principally to technique, viz, some little manipulation done wrongly in the making of the model, in the mixing of the plaster, in the heating of the investment, or the casting. Until some investigator will show us what to do in every case, what line of technique to follow exactly, we will never be sure of a casting. I have had mesio-occluso-distal inlays go perfectly to place, but I have had more of them just a little off. To illustrate, the other day I had two large mesio-occlusal inlays to cast. The wax was the same in each and handled in the same way, Taggart's investment was made for both by my assistant in one mix, and the result was one smooth inlay going beautifully to place in the cavity, the other having a great many little bubbles. Again, another large inlay cast in a hurry was about as smooth and perfect a casting as I have ever seen. I am sure that a perfect filling can be made by casting, and when someone tells us in simple words how to do it every time, I hope to take a good vacation to celebrate the occasion. I am sorry that Dr. Hinman has not evolved some technique for casting.

The method advocated by him, of using a swaged lining, is undoubtedly the best method to follow in difficult cases, this lining to be swaged in an amalgam model. Hood attachments I have used for some years, swaging them directly into the tooth. Lately I have been greatly helped, and have saved time by taking an impression in modeling compound and immediately pouring a model of Dr. Barnes' Quick-model. This is immediately sufficiently hard to swage 24-karat plates upon, making the final adaptation in the cavity.

Anyone who has not used the different applications of this hood attachment as described by the essayist will certainly find this paper very valuable. Another very good point mentioned is the proper contouring of bands. When a band is fitted closely to a root which is denuded of its enamel, that proper contour must be restored in fitting a crown of the proper width. There is no question that a band left flat and uncontoured above the cervix will cause further recession.

Dr. Hinman has given us a very excellent subject to discuss, and we shall be glad to adopt some of his methods. As a comment upon the technique for the different crowns, especially as to the gold crown method of casting over 30-gage platinum, I think this procedure rather expensive for the average practitioner and not a time-saver. Gold of 22-karat can be cast over 22- or 24-karat very nicely, and the cervical contour filled in with 22-karat solder, if one does not bring the casting up to the edge of the band.

The silicates I have used to advantage in some cases for filling-in the surface of a crown, also in building up the face of a large inlay.

Dr. L. J. Weinstein, New York. With Dr. Hinman's permission I should like to start an argument with Dr. Van Horn. He has taught me what little I know about expansion and contraction of wax in inlay work, and he has either made an error or forgotten something. He has taught me that it is not so much the contraction of the gold that makes imperfect inlays, as it is the contraction of the wax; consequently a matrix that is rigid enough to prevent expansion in the wax would eliminate to a certain extent the contraction of the gold. I am simply taking Dr. Van Horn to task for his own teaching.

We have heard of three different methods of making inlays, each method being apparently satisfactory to its advocate, and I will describe a fourth method.

Generally, pure gold is too soft for large inlays when a masticating surface is involved, and a strong hard gold is wanted. In all of the three methods mentioned the edges have to be burnished, but the more rigid the gold the more difficult it is of adaptation. I have used a number of times a method shown to me by Dr. Gillett of New York. He first casts a thin gold shell of pure gold for the cavity surfaces, and burnishes that to the cavity margins. He then takes an impression with the shell in place, and casts an inlay of solder; the two portions are now soldered together and inserted as one inlay. No contraction occurs in this procedure, for the reason that the bulk of gold expands sufficiently to more than compensate for the contraction of the solder used, and with all due respect to Dr. Van Horn's method, which I admit is superior to the three methods mentioned, I think this fourth method to be superior to his.

If we imagine for a moment that no contraction of the gold in the investment occurs, then theoretically we should obtain perfect inlays. But this is not the case. I claim that the fault lies more in the technique and the materials than in the actual movement of the gold or wax. As Dr. Hinman stated, in using several investments heated for different periods, he observed various degrees of distortion, which certainly proves that the manner in which the molds are heated influences the casting. There must be a difference in heating a mold twelve minutes or two hours, and allowing it to stand from twenty-four to forty-eight hours. These points must be taken up rationally and determined, because they apply to all kinds of casting. Surely these preparatory steps should not be taken in an empirical manner. In other words, it is easier to control these preliminaries than to control the movement of gold; there is no reason, then, why these factors should not be investigated, and the proper procedure determined upon.

One other factor in casting inlays, which is an important one, is the temperature of the gold at the time when it enters the mold. Dr. Taggart advocated the use of golds alloyed with copper in preference to platinum, for the reason that, at high temperatures, platinum alloys form a silicate with the silicate in the investment compound. I do not quite agree with this argument chemically, but I think it is not so much a question of what alloy is employed, as at which temperature that alloy strikes the investment. The fusing-point of silica quartz is 3300°, therefore we must see in every case that the investment is kept down to a point of a little over 3000° F. If in casting we superheat pure gold, which melts at 2000°, by 500°, there is not much difference between the temperature of the gold and the investment, and some union may take place, causing a rough casting. The utmost precaution must therefore be used against superheating the gold, and I think the best insurance policy we can have against this is the use of the gas blowpipe, for the reason that we can only reach a certain limit of heat, which is not sufficient to fuse the investment.

(Dr. Weinstein then showed a number of lantern slides illustrating his methods of casting inlays, making crowns, etc.)

Dr. Van Horn. I am averse to discussing the discussion of a paper unless I happen to be the essayist; furthermore, when I do enter a discussion, I always endeavor to confine my remarks to the text. Dr. Weinstein seemingly overlooks this latter fact, and brings in extraneous remarks respecting the physical properties of pattern wax under varying thermal conditions. We would again point out that Dr. Hinman confines his remarks to the indirect method; he is working outside of the mouth, and wax is constant in its dimensions in a constant temperature. The little change which might occur in the temperature of the room during the time of working the wax would be so small that it would not have any appreciable effect, hence there would be no change in the wax pattern. If Dr. Weinstein will review the articles referred to, published in the Dental Cosmos, and will then analyze my present discussion, I feel certain that

he will have a clearer understanding of the conditions involved and the results that obtain.

Dr. W. A. Capon, Philadelphia. Everything in dentistry has been and likely will be a matter of evolution, to a great extent. We have seen a great many changes. It was only a short time ago that all we had to do was to advocate some new method of root-filling and intense interest was displayed at dental meetings; yet, while the importance of that topic is very great, we have shifted much of our interest to the gold casting process—and goodness only knows where it will end! First of all, I am pleased to say that Dr. Hinman is a practitioner of wide experience, and we gain much by his presence. I fully agree with him in regard to casting under various conditions and with all sorts of appliances, for with any one of the hundred or more different machines and methods for casting, the results depend upon the technique, after all. If we do not follow a certain technique, we cannot produce satisfactory results.

Casting with sharp-edged steps in the cavity is a problem which few operators probably have ever taken seriously. In other words, in making steps in the formation of a cavity, it must be remembered that this form is to be reproduced in the investment, and these sharp edges, in a soft and breakable substance, are liable to brush off and cause a misfit of the inlay. This point I learned from Dr. Hinman six years ago when he read a paper at Baltimore. In the preparation of cavities we should exclude also the sharp right-angle corners on the gingival border advocated by so many teachers, because of our inability to introduce the wax in these places accurately.

With regard to pressure in casting, I will say that I am familiar with the majority of machines, ranging in price from one hundred dollars to almost as low as five cents. I use the Taggart machine, also the Jameson centrifugal machine, but to the students at the University of Pennsylvania we teach the use of the Seymour machine, because it is simple, and the results are quite wonderful. I am not advertising any appliance, but I would say that cost does not make the difference between machines as far as results are concerned, if the necessary detail is correctly followed. In making some specimens recently, I again became convinced that we can obtain as good gold castings with a cheap machine as with the Taggart machine. The pressure applied in casting is an important factor. In using the Taggart machine quite recently, I have been able to produce some beautiful castings with three pounds' pressure. The essayist advocates a pressure of about five pounds, and I agree with him that that is quite sufficient. When we first started this work, we used from fifteen to twenty pounds' pressure, but we know now that that is too much. Very little pressure is necessary for accurate casting.

The heating of the mold is another consideration that has been duly emphasized by the essayist. When we first started to do this work, we heated the mold almost to red heat, but we had to abandon that practice. I have been following the direction of Dr. Taggart chiefly, and he, with many others, asserts that the best work can be produced with a cold flask. I had the pleasure of attending the great meeting of the Illinois State Dental Society's golden anniversary, and I wish everyone present had been there, as it was the greatest meeting ever held by dentists. One of the principal features of the meeting was the clinics, and probably two-thirds of these demonstrated the casting process. All sorts of methods and ideas were presented—so much so that, when it was all over, I felt considerably confused. One clinician said that we could cast best with 22-karat solder, and he was one of the best practitioners in Chicago. Another clinician stated that we should never use pure gold under any circumstances; another used platinum alloy. One genius from Minneapolis showed a large brass tooth in which a mesio-occluso-distal cavity had been prepared, and during the meeting he had several

men try to make an absolutely perfect casting for this brass tooth. While I am of the essayist's opinion, that the making of a casting to fit a model of a hard metal is much more difficult than casting to a softer material, at any rate this clinician had a half-dozen castings that would probably be generally accepted as having an adaptation so nearly perfect that they were beautiful. The clinician asked a professor in one of the western colleges to cast an inlay to fit the cavity in the brass tooth. The instructor said that this would be easy. This occurred on Saturday morning, and at one o'clock Sunday morning he was still trying to make a casting that would fit perfectly. He cast about eighty-five gold inlays, and then gave it up. This is what we have to contend with in a great many instances, if we want a perfect casting. So far as the solution of the problem is concerned, I am sure that we shall have to take a little hint here and there, and pursue the method by which we can procure the best results. If Dr. Hinman gets better results with the use of a matrix for the wax than another practitioner, this does not mean that his method is wrong, but it means that each operator can produce best results by different methods, for in this, as in every domain of dentistry, the personal equation has to be taken into consideration.

With regard to the use of the matrix —and I do not think many operators have had more experience in making matrices than I—I claim that the matrix has another advantage, namely, that we shall have a border to burnish, which we all prefer. If a matrix of that kind is used first, then the surplus edge can be burnished at the gingival border, and we need not be afraid of the cement washing out. I speak from experience in this matter, because hundreds of my porcelain inlays have stood the test for twenty years, the margins having been prepared in this manner.

Dr. Hinman (closing the discussion). I am very much delighted that my paper has created so much discussion. With reference to Dr. Guilford's discussion and his method of making the Carmichael hood, I would say that I cannot make satisfactory mesio-occluso-distal inlays or hoods by the direct method, because I have never been just sure that I could take an accurate impression of a mesio-occluso-distal cavity in the mouth with wax, unless I surround that tooth with a continuous band matrix. Dr. Guilford may be able to accomplish this, but I am not. In pressing the wax into a mesio-occluso-distal cavity, the wax has a tendency to spread away from instead of hugging the margins, and especially is this true if one allows the patient to bite into the wax, which spreads it out worse. This is why the method seems inaccurate to me. The method suggested of expanding the wax form or matrix seems to me to be very inaccurate, and I prefer to use the metal lining.

As to Dr. Van Horn's criticism of the indirect method and the impossibility of taking an impression of a mesio-occluso-distal cavity in a typically formed tooth, I will admit that this is very difficult, but I cannot admit that it is impossible to take an accurate impression, for I know I can do it. We must remember in taking impressions of teeth that not all present what we may call the typical form; but there are a great many that anyone can easily take an impression of.

In reference to the matrix overlapping, I fear that Dr. Van Horn misunderstood me when I said I overlapped the matrix; I fear he has the idea that I leave that overlap. Nothing is further from my practice than to leave that overlap in the finished inlay. The only reason why I put it there is that, in casting, the metal may not flow over the margins. The casting is returned to the metal model and finished down by cutting off the overlap of pure gold. Iridio-platinum staples in mesio-occluso-distal inlays have been used by me to a considerable extent. Dr. Price tells me that such a staple has very little value when we cast pure gold over it. It does not to any great extent control the shrinkage or strengthen the inlay, although it must have some such influence.

As to Dr. Van Horn's reference to placing crowns on vital teeth, this is a question which, if opened for discussion, would be interminable. There are a great many cases in which it would be folly to attempt to crown a vital tooth. It would be suicide not to devitalize the pulp and fill the root-canals in a great many instances, but in some cases, I believe, we are warranted in putting crowns on vital teeth.

In reference to the single attachment, that is, what we call the wing bridge; Dr. Van Horn does not advocate this form of bridge, but rather protests against its use. This is simply a question of occlusion. I have followed this plan in selected cases for many years, and have seen some cases where the occlusion was not properly cared for, and the tooth that held the attachment was rotated in its socket and thrown out of alinement; but when the occlusion is taken into consideration and the proper adjustment of the single dummy is made, I believe satisfactory results can be obtained.

As to casting on porcelain, I have to say that Dr. Van Horn may be able to accomplish that satisfactorily, but I cannot, and I am very much afraid that a great many of us are casting directly against porcelain, which is an extremely dangerous procedure. If everything is exactly right, then we may be able to cast against porcelain, but I have never been able to do it satisfactorily.

In answer to Dr. Booth, who complains that I have presented no new technique of casting, I have to say that I did not go into the technique of casting because I felt that you were all familiar therewith, and I have nothing new in that line to offer. I assumed that all are familiar with certain facts and factors in the casting process. Dr. Booth also speaks of the price of the cast crown. I did not consider the question of price, but simply the question of how to obtain the best results.

Dr. Weinstein speaks of the combination of silicon with gold in casting, especially when the oxyhydrogen blowpipe is used. I have found, if we are making a direct casting from a direct wax form or matrix, that with the button that is left for one casting, it is inadvisable to attempt to cast another inlay using the same button, on account of the combination of silicon with the gold, or if we are using the nitrous oxid blowpipe, to employ a combination of nitrogen with it. Gold never seems to give a perfect casting after it has been fused once, and I think we should use a fresh button of gold for each casting. Dr. Weinstein evidently casts in a hot mold in making a gold crown; I cast in a cold mold. Sometimes, to be sure, the gold does not flow completely around the cervical border, and then we have to make an addition of solder as he indicates. The method of lapping the gold with the Goslee teeth is very admirable; although I omitted to mention it. I have always followed the plan of lapping the gold considerably, just as much as in mesio-occluso-distal inlays, with the only difference that Dr. Weinstein grinds the porcelain and narrows the saddles, which I think is an admirable method. In dowel crowns, he points out, it is easier to make a second dowel to hold the crown instead of using the pin as it passes through the cap. It is only in a few cases that this is necessary. Dr. Weinstein refers to soldering the dummies separately. That has been my practice for years. I finish each dummy separately and then assemble the dummies and solder them together. These are placed on the model and it only remains to attach the dummies to the distal and mesial attachments; in this way, to a great extent, we prevent or control the shrinkage which causes a misfit. This is absolutely necessary when an inlay or a hood attachment is used as an abutment.

One point which Dr. Capon mentioned I should like to emphasize, viz, that it is imprudent to leave a narrow neck in the occlusal step, as the gold, in flowing in, knocks off the sharp corners of the investment. Dr. Capon also calls attention to the futile effort of an operator to fill a mesio-occluso-distal cavity in a metal model. I have been working

for years along a different line; instead of using metal, I have been using a simple mesio-occlusal cavity cut in a porcelain tooth, and I have never found anyone who could cast an inlay to fit that cavity, and I have attempted it many times myself. The difference between this porcelain and a natural tooth is that, when we force an inlay in the natural tooth, the dentin expands, the tooth is flexible, while the porcelain tooth possesses no flexibility.

In closing, I wish to say that my purpose in presenting to you these different attachments and the methods which I use in casting was to show procedures which I have been following, and which might be adopted by some of you to advantage. I will, this afternoon, show the complete technique of casting the hood abutments, which I always cast in a matrix. I appreciate the honor which you have bestowed upon me in asking me to appear before you, and wish to thank you cordially for the courtesy and attention you have shown me since I have been here.

The next order of business was the installation of officers, after which the motion was made and carried to adjourn until the next annual meeting, to be held June 22 to 25, 1915.

(To be followed by Clinics.)

CORRESPONDENCE.

SOLVENTS OF GUTTA-PERCHA.

To the Editor of the Dental Cosmos:

Dear Sir,—On page 225 of the Dental Cosmos of the current year you have published an excerpt from an article originally published in the *British Dental Journal,* London, December 15, 1914, entitled "The Action of Oil of Cloves and Other Oils on Gutta-percha Points," by H. Humphry, Dartmouth. Besides the inaccuracy of the experiments to which you call attention in a footnote, the article contains various statements which do not conform to known chemical facts. The author states: "Oil of eucalyptus . . . dissolved the gutta-percha, oil of cinnamon and oil of cajuput caused no change, while oil of cloves caused a large increase in size in all directions."

As a matter of fact, oil of eucalyptus *and* oil of cajuput dissolve gutta-percha. Both oils contain as their principal active constituent a body chemically known as cineol, and pharmaceutically respectively as eucalyptol and cajuputol. A good oil of eucalyptus should contain 60 per cent., while oil of cajuput contains a somewhat less amount of cineol. This cineol is *the* agent which dissolves gutta-percha. Oil of cloves and oil of cinnamon do not contain cineol, but other active constituents, of which eugenol (oil of cloves) and cinnamic aldehyd (oil of cinnamon) are the chief representatives. Both oils have apparently no solvent effect on gutta-percha.

Sincerely yours,

Hermann Prinz.

Philadelphia.

THE DENTAL COSMOS

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Devoted to the Interests of the Profession.

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EDWARD C. KIRK, D.D.S., Sc.D.

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PHILADELPHIA, MARCH 1915.

EDITORIAL DEPARTMENT.

OPPORTUNITY.

IT is generally conceded that one of the chief factors of success in life is preparedness—readiness to take advantage of the opportunity when circumstances create the opportunity. Indeed, the ambitious man, the one who efficiently carves out his way to success, he who is the so-called architect of his own fortune, does not wait for circumstances to create opportunity. He makes opportunities for himself. Nevertheless the ready-made opportunity not infrequently presents itself, and the wise man who has realized the importance of preparedness, who has the keenness of vision to recognize the opportunity which occasion presents, the ambition and willingness to seize the occasion at the opportune time, is the one who succeeds beyond the average of his fellows, and who ultimately solves his life problems in terms of success.

But opportunity knocks at the door of the community, the state, and the nation. It offers its allurements to groups of men

as well as to individuals, and the relationship of preparedness to success applies equally to all.

Dentistry is no exception to the general rule. Comparatively recently the profession of dentistry has had presented to it the opportunity to render an inestimable public service through the channels of oral hygiene. It is unquestionably true that the success of dentistry in this connection depends definitely upon the preparedness of our profession to answer in terms of demonstration the question now being asked by the public and by the medical profession, To what extent may we depend upon oral hygiene for the relief of certain bodily ills and for the prevention of disease?

The answer in the affirmative is gradually and certainly forthcoming. The oral hygiene movement is the result of a comparatively slow evolutional growth. The axiom that clean teeth will not decay is centuries old, but it is only recently that any comprehensive understanding of the widespread application of this axiom has been possible, and it is only recently that the general recognition of the importance of the involved problem has created the opportunity for public health dental service which the dental profession has been called upon to meet.

Opportunity, therefore, may be the product of a slow evolutional process, or it may develop suddenly in the revolution of the wheel of circumstance. For a half-century we have in various parts of the world endeavored to impress upon those concerned in the administration of state and national affairs the importance, indeed the necessity, for dental service in connection with those employed in the government defense. The importance of dental service in connection with the armies and navies of the world has been urged by the dental profession in all civilized countries—in many instances with little or no result; in others it has received more sympathetic attention, and in a few instances has been experimentally adopted.

Suddenly the greater part of the civilized world is engaged in mortal combat; the most devastating war in the history of the human race is now in progress; gunshot wounds of the head and jaws in countless numbers require the skill and specially trained services of the oral surgeon and the dental expert. The health and not infrequently the lives of soldiers are jeoparded by the

lack of oral hygiene. Bodily infections in wounded soldiers arising from uncleanly mouths are unnecessarily increasing the death-rate in military hospitals, and the demand arises everywhere in connection with military hospitals for the special service that only dentistry and oral surgery can render. The opportunity needed to convince all concerned of the justness and practicality of the demand made by the dental profession for the past half-century for a recognition of the importance and efficiency of the service which they are able to render under the circumstances existing is now signally confronting us.

Again, the question of successfully solving this problem involves the factor of preparedness upon the part of the dental profession to take advantage of the present opportunity. Moreover, in the present instance the humanitarian side of the problem looms before us in colossal proportions. Every dental practitioner knows full well the extreme suffering and distress which arise from gunshot wounds and dental and oral injuries received in battle. These cases necessarily make a strong appeal to the sympathies of those who best understand their urgency, and while we may not at present be able to furnish a sufficient number of skilled operators to practically care for these cases, we can all of us contribute to their relief and treatment in a material way through the agencies set forth in the announcement appended to this communication.

It is hoped by the committee in charge of this movement that every dental practitioner who reads this appeal will regard it as *his* opportunity to do two things: First, to practically manifest his allegiance to the best interests of his profession; and second, to practically express his sympathy for a class of suffering humanity whose affliction comes nearest to him in a professional way, so that the combined help of the dental profession in this connection may be practical evidence of the faith of the dental profession in its contention for the establishment of adequate dental service in connection with the armies and navies of the world.

The Appeal.

At the meeting of the American Institute of Dental Teachers held at Ann Arbor, Michigan, on January 26th, it was decided to take steps that should result in the raising of a fund to be used through the Red Cross Society in giving relief and aid to the soldiers in Europe who are

suffering from oral and dental injuries. The president was instructed to appoint a committee to take charge of this matter. President F. W. Gethro, under this instruction, appointed the following Executive and General committees:

Executive Committee.

Henry W. Morgan, E. A. Johnson, Ellison Hillyer, John F. Biddle, *Sec'y;* C. R. E. Koch, *Chairman.*

General Committee.

E. C. Kirk, Philadelphia
J. H. Kennerly, St. Louis
H. C. Miller, Portland, Ore.
D. M. Gallie, Chicago
John F. Biddle, Pittsburgh
E. T. Darby, Philadelphia
Alfred Owre, Minneapolis
B. Holly Smith, Baltimore
E. A. Johnson, Boston
Frank Holland, Atlanta
D. M. Cattell, Memphis
Frederick R. Henshaw, Indianapolis
S. W. Bowles, Washington
E. H. Smith, Boston
A. H. Hipple, Omaha
Ellison Hillyer, New York
Truman W. Brophy, Chicago
D. H. Squire, Buffalo
H. E. Friesell, Pittsburgh
Henry W. Morgan, Nashville
I. N. Broomell, Philadelphia
Wallace Wood, New Orleans
Frank T. Breene, Iowa City
H. L. Banzhaf, Milwaukee
J. G. Sharp, San Francisco
G. V. Black, Chicago
W. T. Chambers, Denver
H. M. Seamans, Columbus
J. D. Patterson, Kansas City
N. S. Hoff, Ann Arbor
C. N. Johnson, Chicago
H. L. Wheeler, New York
L. E. Ford, Los Angeles
C. R. E. Koch, Chicago
H. B. Tileston, Louisville

The Executive Committee is contemplating the issue of contribution certificate booklets. Each booklet will contain twenty certificates or coupons certifying that the holder thereof has contributed twenty-five cents to this fund. This certificate will be neatly lithographed, something like national currency. It will be printed in lilac ink—the color of the dental profession—and bear upon its face the Red Geneva cross.

It is hoped that the dental schools, dental students, and dental societies, as well as the profession at large, will become sufficiently interested in this propaganda to secure a large enough fund through these small contributions to secure real relief for the class of war sufferers for which it is designed. That it may aid in the establishment of several special hospitals or wards devoted to dental and oral surgical injuries, within the belligerent zone of Europe, is the ultimate purpose of this movement.

It is expected that these booklets will be ready for distribution on or before March 1st. Applications for them may be made to Dr. John F. Biddle, of Pittsburgh, Pa., secretary of the Executive Committee; or to Dr. C. R. E. Koch, 31 West Lake st., Chicago, chairman of the committee, before March 1st. After that date all the members of the Executive Committee and General Committee will be in a position to supply them.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Ohio State Medical Journal*, Columbus, August 1914.]

SOME CONSIDERATIONS AFTER 13,000 ADMINISTRATIONS OF NITROUS OXID. By Dr. W. L. Jones.

[*American Journal of Surgery*, New York, January 1915.]

NITROUS OXID AND OXYGEN DOSAGE IN ANESTHESIA. By Dr. Karl Connell, New York.

FRACTIONAL REBREATHING IN ANESTHESIA—ITS PHYSIOLOGIC BASIS, TECHNIQUE AND CONCLUSIONS. By Dr. E. I. McKesson, Toledo.

[*Northwest Medicine*, Seattle, September 1914.]

NITROUS OXID AND OXYGEN ANESTHESIA. By Dr. H. L. Geary.

In his record of thirteen thousand administrations of nitrous oxid and oxygen, Jones reports but one fatality on the table in an extra-hazardous risk. While a large percentage of these cases were for dental operations, quite a number concerned major surgical operations in bad subjects. The youngest patient was four weeks, the oldest eighty-six years, the operations being for cleft palate and prostatectomy respectively. The writer's experience with nitrous oxid and oxygen in brain surgery corroborates Teter's findings, satisfactory anesthesia being maintained by 92 parts of nitrous oxid and 8 parts of oxygen. Experiments during these operations proved conclusively that discoloration, dilatation, and protrusion of the brain occurred only in the presence of oxygen deprivation, and assumed dangerous proportions only when asphyxia was imminent. Jones has met with occasional instances of acapnia in anemic, asphyxia in plethoric, obese, and alcoholic subjects; but all these cases responded promptly to artificial respiration and perflation with oxygen.

McKesson's findings as to blood pressure during four thousand nitrous oxid and oxygen anesthesias are also corroborated in Jones' experience, and he has observed that any imperiling turgescence of bloodvessels, even in the presence of arterio-sclerosis, must be the result of either asphyxia or pushing the anesthesia beyond the depth required for surgical interference. For safe and satisfactory results with this technique of anesthesia, the writer suggests that the anesthetist should bring as much skill to its administration as the surgeon does to the operation. He offers his records and the desperate character of many of the cases tabulated to controvert the efforts of some surgeons to condemn this method indiscriminately.

Ether in small amounts for the purpose of relaxation was required in from 20 to 25 per cent. of the cases recorded.

The conclusion reached by Jones is that, while nitrous oxid and oxygen anesthesia does not make the work of the surgeon easier, it is immeasurably better for the patient than any other form of general anesthesia. Connell maintains that the effect of a given nitrous oxid and oxygen mixture is constant on normal man. The anesthetic effect is in a degree inversely as the proportion of the oxygen. The ultimate gas tension which the drug establishes is not at present an available gage of dosage. The only available gage of qualitative dosage is the proportion of oxygen with which the drug is administered. The action may be differentiated into consecutive levels or zones of anesthesia, according to the average amount of oxygen present in the tidal gases. For analgesia in normal man, the proportion of oxygen in the tidal gases of breathing may exceed 20 per cent. Below this, the consciousness becomes gradually abolished until at 16 per cent. the patient slowly becomes unconscious. From 14 to 11 per cent. there is sufficient anesthesia for surface operations; from 11 to 8 per cent. for abdominal surgery, associated, how-

ever, with slight asphyxia and without proper muscular relaxation. Below 8 per cent. the mixtures are useful only for induction of anesthesia, and below 6 per cent. they become so highly asphyxial that they should not be used even for tooth extraction. Higher percentage of oxygen is required when the tidal volume is below the average, or the oxygen-carrying capacity of the blood is diminished. At least 6 liters of fresh gases per minute are required for smooth anesthesia and to establish normal excretion of carbon dioxid and other gaseous waste products; preferably 8 to 10 liters per minute of a uniform mixture is supplied in a continuous flow. By continuous flow and known dosage with accurate and constant measurement and control, the level of each patient may be found rapidly, and after the first fifteen or thirty minutes anesthesia may run continuously without further adjustment. Unsupplemented nitrous oxid and oxygen anesthesia is ineffective to block the centripetal stimuli of operative trauma. Nitrous oxid and oxygen anesthesia is most advantageously supplemented by ether. Light ether anesthesia, the light subconscious zone of ether, a tension of from 15 to 25 mm., in conjunction with the subconscious or light subconscious zones of nitrous oxid and oxygen anesthesia, 14–16 or 16–20 per cent. of oxygen, is physiologically the most advantageous of all anesthetic states. Owing to present complexity and inaccuracy of administration, the average nitrous oxid anesthesia, even when it is effectively supplemented, possesses no practical advantage over properly induced and well maintained ether anesthesia, according to Connell.

McKesson states that rebreathing during the administration of nitrous oxid and oxygen will not only control the tendency of preliminary alkaloidal medication to decrease the rate and the volume of pulmonary ventilation, but will also, in association with overventilation with oxygen and carbon dioxid, combat the effect of morphin in preventing the elimination of ether from the system, if ether is used. Rebreathing is a perfecting detail in the administrative technique of nitrous oxid and oxygen anesthesia, and the fractional method of rebreathing made possible by the writer's fractional rebreathing bag affords a practical means of measuring the tidal respiration. This method selects automatically those gases coming from the upper air-passages to be returned for rebreathing, and eliminates from the apparatus the latter portion of the exhalation coming from the alveolar portion of the lungs, which contains six per cent. carbon dioxid, and is poor in anesthetic properties. This method has the further advantages that it controls the tension and elimination of concomitant etherization when employed; it prevents the rapid breather from using more gas per minute than he would of air if normally asleep; it makes the light breather increase the depth or volume of respiration, thus securing a better absorption of the anesthetic and a more satisfactory plane of narcosis; it reduces gas consumption to accuracy, and to an economic basis which puts the technique within reach of all.

Geary enumerates the many advantages of nitrous oxid and oxygen anesthesia, which are in his opinion as follows:

(1) Comfort of the patient during the period of induction and elimination plus the absence of postanesthetic vomiting. The patient passes quickly and very quietly into deep anesthesia, and in the majority of cases surgical anesthesia may be induced within three minutes.

(2) It has practically no odor, and when administered to the patient warm with oxygen in the proper percentage, he is hardly aware that he is taking an anesthetic, especially if he has ever taken ether or chloroform.

(3) Nausea rarely occurs, when there are no other nausea-producing factors.

(4) It is not irritating to the respiratory passages nor to the kidneys.

(5) It does not cause fatty degeneration of the liver cells, and has no effect upon the lungs, provided it is administered warm.

(6) It does not produce any harmful effects upon the phagocytes, and is therefore indicated in infections.

(7) The patient is fully awake and in possession of his mental faculties within a few minutes after the anesthetic mask is removed.

(8) Subsequent administration has, as a rule, no harmful effects.

(9) Its administration is indicated in patients suffering from infectious diseases, and those having a low resisting power.

(10) Its rapid elimination from the system. The rôle of shock is far less than that of ether or chloroform.

(11) The patient is plunged into a deep surgical anesthesia within a few minutes,

passing through the stage of excitement very quickly.

(12) It does not produce an accumulation of mucus and saliva.

The disadvantages of this anesthesia are very few in the hands of a highly skilled anesthetist, and they should be looked upon by the modern surgeon not only from a scientific point of view, but from the patient's standpoint, and that of a good prognosis. They may be enumerated as follows:

(1) To obtain the best results a trained expert is required who fully understands the action of the two gases, the symptoms of the patient, the fundamental principles of anesthesia, and the minute adjustment of the apparatus.

(2) Deep relaxation in some cases is not easily produced.

(3) It requires an expensive and accurate apparatus for its scientific administration, and one that is equipped with an ether attachment, so that ether may be given if occasion demands it.

(4) The anesthesia is somewhat lighter and more transient than that produced by chloroform or ether.

(5) It requires much watchfulness and skill on the part of the administrator to produce an even narcosis.

(6) The zone of anesthesia is narrow, with consequent uncertainty of muscular relaxation and freedom from reflex movements.

As a rule, a child of only a few years is not a good subject for nitrous oxid and oxygen. Children are hypersusceptible to both nitrous oxid and oxygen; in other words, they are easily asphyxiated even from a small quantity of nitrous oxid, and they readily respond to an overdose of oxygen, which brings them out of the anesthetic.

[*Deutsche Medizinische Wochenschrift*, Berlin, 1914, No. 30.]

CHRONIC COPPER POISONING CAUSED BY THE WEARING OF A POOR GOLD ALLOY IN THE MOUTH. By Prof. Dr. Erich Harnack, Halle.

The writer, whose name stands among the first in toxicology and pharmacology, reports a case in which he was called upon to give expert testimony. The patient, a young woman who had enjoyed excellent health, had a stationary gold bridge inserted in her mouth in 1908, and from that time on had been suffering with progressive cachexia. She first developed gastric and intestinal troubles, associated with vomiting and complete loss of appetite; later on she had severe spasms of colic and muscular tremor, dyspnea and severe coughing, and finally, since 1912, muscular debility and extreme cachexia. She also claimed that the color of her hair had changed. When the bridge was removed in January 1913, an intense odor as of verdigris was observed, which persisted for three weeks in the root-canals, which showed a greenish discoloration. Upon the removal of the bridge, the woman's condition gradually improved to normal.

Chemical analysis of the bridge showed it to contain about 70 per cent. base metals, chiefly copper and zinc, hence that only about one-third of the bridge consisted of gold—hardly 8-karat. Harnack diagnosed the case as one of slowly progressing systemic copper-zinc intoxication, caused by the bridge, with presumably ultimately fatal result. The intoxication is caused by the acids formed by fermentation, and putrefaction in the root-canals produced organic copper compounds which entered the circulation. The writer advises that dental bridges should always be made of a gold of high purity, never of inferior alloys containing copper and zinc. Such low-grade alloys, in his opinion, are more dangerous than pure copper or zinc, since the contact of the oral fluids with such alloys may produce electric currents and the formation of absorbable metallic compounds.

The discoloration of the hair, which is observed the earliest in blondes, Petri attributes to a deposition of microscopic copper-bearing crystals upon the hair cuticle, their number decreasing toward the root, which itself remains free therefrom.

[*Deutsche Monatsschrift für Zahnheilkunde*, Berlin, February and July 1914.]

ROOT-CANAL TREATMENT WITH SUBLIMATING SUBSTANCES. By Zahnarzt Bauchwitz, Stettin.

THE PROBLEM OF ROOT-CANAL FILLING. By Karl Elander.

Adding a modification to the many methods of root-canal filling already in vogue, Bauchwitz argues that some bactericidal medicaments lose their crystal form and volatilize, penetrating the finest canaliculi, and in these sublimate again, being precipitated in the root-canals in crystal form. His formula consists of benzoic acid 5, boric acid 5, and

iodoform 1, this mixture being heated in a specially constructed appliance over an alcohol flame, the ascending vapor being guided into the root-canals, where it penetrates to the finest extremities and is precipitated upon the canal walls as an antiseptic filling. The lumen of the canal is filled with the soft paste. No suggestion is made in regard to the hermetical sealing of the root-apex.

Elander emphasizes the importance of asepsis rather than antisepsis in the filling of root-canals. He uncompromisingly demands aseptic methods of operating and aseptic obturation of the canal, for the reason that antiseptic root-fillings lose their efficacy sooner or later. After a thorough mechanical removal of the pulp tissue, the root-canal is wiped with concentrated trichloracetic acid, and then filled with formic geranium oil and asbestos, this in turn to be covered with a mixture of 10 parts of gutta-percha, 75 parts of quartz, and 15 parts of zinc oxid. This soft and plastic mass is introduced into the canal with a Donaldson broach and an amalgam plugger, and is claimed to be denser than dentin. The writer asserts that it can easily be removed with a bur and by rinsing with chloroform. The writer considers the extirpation of a pulp from the point of view of treatment of a fresh wound, which must be touched only with aseptic instruments, and be treated under the most rigorous precautions of asepsis.

[*Therapie der Gegenwart*, Berlin, December 1914.]

INFLAMMATION OF THE ORAL MUCOSA.

By Prof. Dr. F. Williger.

The writer devotes a passing word to the amazing resisting power of the mucous lining of the mouth, which is in such marked contrast to mucosa in other parts of the body. When the oral mucosa, however, is damaged by a defective tooth or general febrile disease, the secondary stomatitis which may develop is depressing, and measures for its cure are imperatively needed, and give great relief. Even when there is no actual inflammation, proper care of the mouth may ward off secondary parotitis, besides its effect on the appetite and spirits. Not only the teeth, but the gums and tongue must be wiped off with the finger wrapped in a thin layer of cotton. The best way, in the writer's opinion, is to cut a piece about 4 by 10 cm. out of sheet cotton, and then peel off a very thin layer to wrap around the finger, and dip the finger in a mouth-wash. By using plenty of the fluid, the mouth can be thoroughly cleansed without hurting. The patient can do this himself when perseveringly trained until he does it right. Three times a day is as often as it should be done, merely rinsing out the mouth after eating at other times. Williger regards it as the criterion for good nursing when the patient's mouth is found clean at the doctor's visit. In contagious diseases, a wad of cotton held with forceps must be used instead of the finger. The mouth-wash must be such as softens up rapidly phlegm and thick coatings, and nothing seems to be better for this than a heaping teaspoonful of sodium bicarbonate stirred into a glass of warm water, supplemented by hydrogen dioxid not stronger than a teaspoonful of the latter to a glass of warm water. Medicated chewing gum also promotes the natural self-cleansing of the mouth. Williger emphasizes that before beginning mercurial treatment the teeth should be put in good order, and all tartar removed.

Ulcerative stomatitis he treats by swabbing with undiluted hydrogen dioxid, repeating this until the fetor has disappeared. The tartar is then removed, not too forcibly, and the ulcerations are swabbed and rubbed quickly with an eight per cent. solution of zinc chlorid. The patient rinses his mouth every hour with the warm, weak hydrogen dioxid solution, and cleans out the mouth besides three times a day with the cotton-wrapped finger. Then the rest of the tartar is removed, and by the third day the ulcers are healing and at the end of a week the cure is complete. Instead of the zinc chlorid, a mixture may be used consisting of a little iodoform and a few drops of alcohol with enough of an 80 per cent. solution of lactic acid to make a thin paste. The tooth-brush hitherto used must be burned.

Aphthous stomatitis requires just the reverse, viz, avoidance of every irritating substance, and merely warm sodium bicarbonate or boric acid solutions to be held in the mouth for five minutes, the mouth thus to be rinsed out six times a day. The aphthæ can be touched with 3 per cent. boric acid glycerin, which is liked by children. Drug stomatitis may range from simple edema to blisters and necrotic patches. It requires mild treatment.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

SECTION I.—*Dental Anatomy, Histology, and Physiology.*

CALCIFICATION OF THE ENAMEL. By Univ.-Prof. Dr. Med. O. Walkhoff, Munich, Germany.

Calcification of the enamel depends upon the ameloblasts only before the eruption of the teeth. Most anomalies in the structure of the enamel are brought about by arrests in the development while the ameloblasts are active. Anomalies of the enamel structure are important with regard to caries.

SECTION III.—*Dental Surgery and Therapeutics.*

PYORRHEA ALVEOLARIS. By Dr. Maurice Roy, Paris, France.

The essayist gives a definition, and maintains that pericemental abscesses are really pyorrhea abscesses. He indicates how to recognize initial lesions of alveolar pyorrhea.

Senile alveolar absorption is the initial lesion of pyorrhea, which is always present and precedes all others, being due to absolutely constitutional complaints. All causes stated to be local are only accessory causes. Pyorrhea is caused by the first lesion, but will not reach the advanced stage unless local accessory complications arise. Prophylactic treatment therefore depends chiefly upon general treatment.

The normal function of teeth attacked by pyorrhea is a desirable element, and therefore should be restored if destroyed. Hygienic conditions are essential in the treatment of the disease, and the dentist must carefully study his patient for its prophylactic treatment.

A COMPARISON OF INLAYS WITH FILLINGS. By Zahnarzt H. W. C. Bödecker, B.S., D.D.S., M.D., Berlin, Germany.

In presenting this subject, the intra-oral conditions have been chosen as a basis of comparison for the various fillings, as these conditions are the most important factor in determining predisposition or immunity to primary and therefore also to secondary caries. These conditions depend upon the chemical composition of the saliva, the hygienic condition of the mouth, and upon the histological structure of the dental tissues. The fillings are compared, with the following point in view: What effects have intra-oral conditions upon the various filling materials, and can the fillings in any way influence these conditions?

SECTION V.—*Dental Prosthesis.*

THE MOVEMENTS OF THE LOWER JAW IN RELATION TO DENTAL PROSTHESIS. By Docent Bloch, Copenhagen, Denmark.

This paper tends to prove how difficult it is to imitate with any degree of exactness the movements of the lower jaw, none of these movements taking place about any fixed axis. The essayist points out the difficulty of recording movements of the jaw. He maintains that these movements do not take place about any fixed axis, and emphasizes the impossibility of constructing articulators capable of imitating the movements in action, concluding that all "anatomical" articulators are of little practical value.

SECTION VII.—*Oral Surgery and Surgical Prosthesis.*

SURGERY OF THE MAXILLA: POST-OPERATIVE TREATMENT BY IODIC FILLINGS. By Dr. B. Landete, Madrid, Spain.

After operation upon the maxillæ, there remain bony cavities which we commonly fill with medicated gauzes, and which take long to become definitely cured, and in the meanwhile require constant care.

To avoid this inconvenience, the essayist has tried the filling of the bony cavities with different iodic pastes, the results being exceedingly satisfactory.

He has used for the purpose Mosetig's iodoform mixture, but objections on account of the smell have induced him to change the formula. The paste consists of iodol-iodocresol-azodolene-nosophene, etc.—10 per cent. of these products to be mixed with 50

parts of spermaceti and 50 parts of cinnamon and lemon essences, etc. He still uses local anesthetics to avoid pain when filling the alveolus of the teeth extracted on account of periodontitis.

He uses a glass syringe previously warmed, in order to make the paste fluid, as it becomes hard when cooling.

SECTION IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

DENTISTRY IN THE ARMY. By R. M. WORMALD, L.D.S.ENG., DENTAL SURGEON TO TROOPS, PRESTON BARRACKS, BRIGHTON, AND GARRISON, NEWHAVEN; HON. ASST. DENT. SURG. BRIGHTON, HOVE, AND PRESTON DENT. HOSP.; DENT. SURG. TO BRIGHTON AND DISTRICT PUBLIC DENTAL SERVICE, BRIGHTON, ENG.

The teeth of the British soldiers are in a terrible condition, and more attention ought to be given to dentistry in the army.

The treatment given at present is of a go-as-you-please character, there being no system or order.

It is very short-sighted policy of the government not to provide an efficient dental service by having commissioned dental surgeons holding the same rank and status as an officer of the R.A.M.C.

Up-to-date dental treatment is essential to keep up the fighting strength of an army, because men with a non-efficient dental apparatus are soon *hors de combat* on account of their inability to masticate the hard biscuits, which have been found the only reliable food on such occasions.

An efficient masticatory apparatus would help in no small degree to fight one of the deadliest foes in war, *i.e.* fever.

A well-organized dental service in the army would bring about many blessings, not only to the soldier individually, but to the nation as a whole.

PERISCOPE.

Removing Modeling Composition Adhering to Vessels.—Particles of modeling composition often stick to the floor and the walls of the vessels in which the water is heated for softening the compound before taking the impression or separating the cast from the impression. To remove these particles, a soda solution is boiled in the vessel, when the compound will come off by itself.—*Technische Rundschau.*

The Future Rôle of Orthodontia.—With preventive measures, healthy environment, earlier treatment, and higher ideal, even comparatively slight malalinements of individual teeth will be corrected. Such defects will not be neglected as being merely of esthetic importance. I look to the time when the Greek ideal of physical perfection may be recovered, and when a stigma will rest upon any parent who allows his child to grow up with any remediable deformity perpetuated. In certain classes of the community, this condition obtains today. All that is necessary is wider and more general knowledge and appreciation. Prevention will reduce the amount of curative work to be done, and we hope that what has to be done will come so much more and more under the fostering care of the state that nearly every child may reach maturity so perfectly equipped in health, physique, and the beauty that comes of these, as to make him one of a finer race of citizens than the world has yet seen, able to acquit themselves like men, and do for the next generation what has been done for them. —N. G. BENNETT, *Ash's Canadian Monthly Circular.*

Avoiding Bubbles in Casting.—The investment compound is not painted on the wax model, but dropped thereon from a toothpick wound with a wisp of cotton and charged with investment compound. The investment may also be squirted upon the model from a syringe. If all other steps of the casting process are carried out carefully, the cast will be perfectly smooth, and the inlay will go to place without grinding.—*Zahnärztliche Orthopädie und Prothese.*

A Mild Caustic.—We not infrequently find gum tissue around the margins of a root grown up into ragged prominences. These may be gotten rid of by applying a little burnt alum.—*Edwards' Dental Quarterly.*

Arresting Post-extraction Hemorrhage.—In post-extraction bleeding, a tampon of cotton saturated in a five per cent. solution of iodin in chloroform is introduced into the empty alveolus, inducing prompt arrest of the hemorrhage.—*Edwards' Dental Quarterly.*

Receding Gums.—Glycerit of tannin, made by dissolving 1 oz. of tannic acid in 4 oz. of glycerin by gentle heating, is applied to spongy or debilitated gums as a tonic astringent lotion. It condenses the soft gums and re-establishes the nutritive functions.—*Dental Surgeon.*

Dissolving Plaster from a Vulcanite Plate.—The last traces of plaster can be entirely removed from a plate by placing it in a solution of hydrochloric acid two parts, and water one part, for five minutes. The plate is then cleansed with a stiff brush.—*Australian Journ. of Dentistry.*

Tincture of Benzoin.—If from any cause the alveolar process has been exposed, pain can be instantly relieved by covering the exposure with a pellet of cotton saturated with tincture of benzoin. The application is also valuable in relieving the painful eruption of third molars.—*Dental Surgeon.*

Protecting Gums in Polishing.—To protect the gums from encroachment of polishing strips, cotton root-canal points are drawn into the interdental spaces as far as they will go. This not only protects the gums, but prevents cutting of the rubber dam, with its subsequent annoyances.—O. L. Beeson, *Nebraska Dental Journal.*

Causes for Failures in Nitrous Oxid and Oxygen Analgesia.—There are eight reasons why not all operators who employ analgesia are successful. These are lack of self-confidence, unfamiliarity with the minute regulation of the apparatus, the placing of too much dependence upon a mechanical appliance, unfamiliarity with the fundamental principles of producing analgesia, overlooking of the necessity of using pure gases, ignorance as to how to introduce analgesia in new patients and obtaining their absolute confidence, the use of an impractical nasal inhaler, and disregard of suggestive therapeutics.—A. E. Smith, *Northwest Journ. of Dentistry.*

Taking Impressions with Modeling Composition.—When the composition has been properly molded on the tray, the external surface of the tray is immersed for a few seconds in cold water, thus preventing the heated metal from causing discomfort and pain to the lips. After drying, the surface of the modeling composition is dusted with French chalk of fine quality, and the impression is taken. This method produces an impression of very fine definition, the composition does not stick to the teeth, and the result is pleasing to both dentist and patient.—P. M. Coughlin, *Commonwealth Dental Review.*

Care of Bridge Work.—The proper care of dental bridge work is often and indeed usually wantonly neglected by the patient. The dentist, however, is largely responsible for failure to observe the same degree of hygiene in mouths in which either fixed or removable structures are worn that is and should be observed in the mouths of those who are so fortunate as to possess a full complement of good natural teeth. To this end the dentist should properly instruct the patient as to the necessity for and best means of keeping the mouth and the work in a thoroughly sanitary condition, as an invariable practice and a religious duty.—H. J. Goslee, *Dental Summary.*

Mouth-Breathing: Its Causes and Results.—Nose-breathing has three purposes, viz, to warm the inspired air, to add moisture to it, and to remove from it mechanical, chemical, and bacterial impurities. Infection with tubercle bacilli is predisposed to by mouth-breathing. Some of the results which may follow mouth-breathing are as follows: (1) Changes in the thorax, which, especially in the child, may result in want of expansion of the highest and lowest areas of the lung; ultimately, apical induration may result. (2) Anemia, which is secondary to disturbances of digestion resulting from insufficient mastication, and to poor appetite. (3) Mental damage, which may be quickly removed as the result of adenectomy.

As the most common cause of mouth-breathing, postnasal adenoids come easily first. Other causes are nasal synechia, hypertrophic rhinitis, and deviation of the nasal septum. As to disturbances of development of the jaws and teeth in children affected with adenoids, it is still a matter of discussion what in these anomalies is cause, what consequence, and what merely an accompaniment.—J. W. Samson, *Zahnärztliche Orthopädie und Prothese*, per *Universal Medical Record.*

An Adjunct in Pressure Anesthesia.—Sometimes when attempting to extirpate pulps under cocain pressure anesthesia, the pulps remain sensitive, as in idiosyncratic cases. I find that 95 per cent. alcohol instead of cocain acts immediately in producing the desired anesthesia in such cases.—A. S. Cambage, *Commonwealth Dental Review.*

Removing Modeling Compound from Impression Trays.—An easy method of removing modeling compound adhering to the tray after the impression has been removed consists in melting a small portion of dental wax in the tray, and then wiping out with a cloth. This will leave the tray clean and bright.—R. Purcell-Cohen, *Commonwealth Dental Review.*

Caries and Constipation.—According to Dr. Nevrezé, systematic caries is associated with other pathological conditions of the organism. The case reported is that of a boy, age thirteen, whose lower incisors showed an exacerbated sensibility. Owing to the fact that caries of these teeth but rarely occurs at this age, there must be some relation between the caries and an organic disease. When a bottle-baby of six months he had suffered from enteritis with diarrhea. At the age of three years he was again affected with enteritis and obstinate constipation, which had persisted since that time. The coincidence of the constipation with the period of calcification of the follicles of the lower incisors is striking. According to Vannier, constipation during infancy is a symptom of a tuberculous process of decalcification, with deposition in the intestine of mineral substances—calcium, iron, silicon—which interfere with secretions and consequently with the normal peristalsis. Simultaneously with the occurrence of the intestinal troubles there was infection of the developing teeth, with lacunar spaces, and the occurrence of caries was hastened by the increased virulence of the bacteria of the oral cavity and the lessened resistance of the tooth substance against bacterial invasion.—*Monde dentaire*, per *British Dental Journal.*

Hints, Queries, and Comments.

Obtaining a Good Plaster Impression for Upper Denture.

I have found the following method to be useful for obtaining a good plaster impression for either a partial or full upper denture. The plaster should be spread with a spatula against the palate and around the "heel" and the frenum before inserting the tray partially filled with mixed plaster, which is then carried to place in the usual way. The result is an impression free from air-spaces, and if the plaster has been introduced at the proper consistence, and before the setting process has proceeded to a point which interferes with the flow of the plaster batter, the result will be an accurate impression, not only of the teeth themselves, but of all the irregularities and the textural peculiarities of the gum tissue.

M. J. Linderholm, D.D.S.

Farmington, Iowa.

Gas-Lighter for Lighting Bunsen Burners.

To avoid the expense and untidy appearance of matches, a patent gas-lighter proves very satisfactory for lighting a Bunsen burner, which is so handy at the operating chair.

Wright B. Lee, D.D.S.

Eugene, Ore.

Preserving Inlay Casting Flasks Clean.

If, after casting, the investment material is jarred out of the casting flask while it is still warm, and the flask is wiped with a dry cloth, it will not rust or muss the sink, as when the flask is thrown into water. Five minutes after casting, no distortions are to be feared in a cast inlay; the warm investment material will easily come out, and the clean flask is ready for the next case.

Wright B. Lee, D.D.S.

Eugene, Ore.

A QUERY FOR THE PROSTHETIST.

THE patient in question has the upper two centrals and two laterals missing. The space between the remaining two canines is too broad for the insertion of four artificial teeth, and too narrow for that of six teeth, if that were possible from an esthetic point of view. What is to be done?

JULIUS PENSAK, D.D.S.

Brooklyn, N. Y.

METHOD OF STRENGTHENING A MODEL FOR SOLDERING BRIDGE WORK.

A VERY useful method of strengthening a model for soldering bridge work is employed in using bright steel screen wire, in suitable size, thoroughly embedded in the plaster investment.

S. T. NEILL, D.D.S.

Clinton, Mo.

OBITUARY.

DR. C. R. BUTLER.

[SEE FRONTISPIECE.]

DIED, December 15, 1914, at Cleveland, Ohio, in the eighty-third year of his age, CHARLES RICHARD BUTLER, D.D.S., M.D.

In the passing of Dr. Butler the dental profession loses one of its most esteemed members: the public loses one who for more than sixty years rendered humanity most excellent service.

Charles Richard Butler was born in Portage county, Ohio, June 28, 1832. His early life was spent on a farm, and later he became a brass and bell founder. When quite young he began the study of dentistry and medicine as a student of Dr. M. L. Wright of Cleveland. After three years of pupilage and practice, he was fortunate in being taken up by that enthusiastic and incomparable teacher, Dr. W. H. Atkinson, who fathered him as a student, assistant, and partner. Dr. Butler became known the country over as "Charlie," sometimes "Charlie Butler." In 1858 he was graduated from the Pennsylvania College of Dental Surgery, and in 1865 was graduated from the Cleveland (W. R. U.) Medical College.

He was taken by Dr. Elisha Sterling as an assistant in general surgery, becoming as well coached in the technique of general surgery as in dentistry—and he was ranked with the most skilful operators in the dental profession.

Dr. Butler was one of the charter members of the Ohio State Dental Society, which was organized in 1866, and was next to the last of the charter members to pass away.

He was president of the Ohio State Dental Society in 1875; president of the American Dental Association in 1888; president of the Cleveland Dental Society and an active worker in these and the Northern Ohio Dental Society. He served on the Ohio State Board of Dental Examiners from 1874 until 1892. In 1886 he was elected a member of the board of directors of the Ohio State Dental Society, and continued to serve in that capacity up to the time of his death.

Dr. Butler designed and gave the profession a number of instruments; plug finishing burs, mallet pluggers and excavators, many of which are still in use. His ability and love for doing fine work led him to the study and mounting of precious stones. Many close friends have much enjoyed viewing the product of his avocation and will long remember the enthusiasm and fondness with which he would show his collection.

Dr. Butler served his profession well as an ardent worker in our societies, while at the same time he rendered his *clientèle* most valuable service. The man will long be remembered, for he was a most kindly, courteous, and cheerful Christian gentleman. We regret that we shall no more see his face in our midst, but we are thankful to have known him. His death occurred on December 15th, after a few hours' illness.

He was a Knight Templar, and thirty-third degree Scottish Rite Mason, his funeral, on

Friday, December 18th, being in charge of the commandery at Cleveland.

H. R. C. W.

DR. J. MORGAN HOWE.

Died, November 13, 1914, in New York City, N. Y., in his seventy-first year J. Morgan Howe, D.D.S., M.D.

In the demise of Dr. J. Morgan Howe, the dental profession has lost a most active and prominent member.

The family of Dr. Howe lived in Sudbury, Mass., for six generations. His grandfather, Dr. Bezaleel Howe, served as captain in the guard of Gen. George Washington throughout the war of the revolution. His father was Dr. John Moffitt Howe, a dentist who practiced in New York City, where the deceased was born on October 19, 1844. In 1853 his father moved to Passaic, N. J., where he practiced until 1867, at the same time enjoying prominence in the educational affairs of that state.

After serving his dental apprenticeship with his father, the deceased started the practice of his chosen profession in New York City in 1867. He received the degree of M.D.S. from the New York state board, and that of M.D. from the New York Homeopathic Medical College in 1879.

The deceased was elected a member of the Odontological Society in 1879, and served for several years as corresponding secretary of this organization. He was one of the charter members of the New York Institute of Stomatology, and three times president thereof. He was a member of the Quill Club from 1895 to 1913.

In 1866 Dr. Howe married Miss Emma Rowe of Passaic, N. J., who died in 1904. In 1911 he married Miss Payne, who, together with three daughters and one son by his first wife, survives him.

During the latter years of his life, Dr. Howe was in charge of St. Bartholomew's Clinic, which he had organized. He was a firm believer in the strictest adherence to the code of ethics, and violently opposed to patents, nostrums, and secret formulæ. He was earnestly engaged in scientific investigation, and was one of the prime movers in the research movement started by the Institute of Stomatology and continued by the First District Dental Society, into which the Institute became merged.

DR. EZRA SPRAGUE HOLMES.

Died, November 11, 1914, in Reeds Lake sanatorium, whither failing health had forced him to move from Grand Rapids, Mich., Dr. Ezra Sprague Holmes, in his ninety-sixth year.

Almost a centenarian, after a life of untiring usefulness, Dr. E. S. Holmes of Grand Rapids, Mich., passed away on November 11, 1914, in Reeds Lake sanatorium, where he had been sojourning but four days in search of recuperation and new health. The deceased was born in Lockport, Niagara county, New York, on July 15, 1819. He took up his residence and practiced his chosen profession in Grand Rapids, Mich., in 1865, and was an important factor in the dental and scientific spheres of that city and state. His reputation as a practitioner was so great that he was offered a chair in the dental department of the University of Michigan, which honor he declined because of his large and exacting practice. He was president of the Grand Rapids Dental Society for two terms; also of the Michigan State Dental Society for the same period of time. As a sign of appreciation the Grand Rapids Dental Society changed its name to the E. S. Holmes Dental Club. He was the founder and for many years president of the Kent Scientific Institute, which developed into the Kent Scientific Museum.

Until his last illness, in which he was faithfully attended by his only surviving daughter, Miss Jennie W. Holmes, the deceased was in remarkably robust health, and displayed alertness of mind and a vivid interest in all matters pertaining to natural science, the study and promulgation of which played such an important part in his fruitful life-work.

Death of Dr. H. B. McFadden.

With great regret we announce the sudden death, from pneumonia, of Dr. H. B. McFadden, which occurred February 14th. A brief sketch of his career will be presented in the next issue of the Cosmos.

Society Notes and Announcements.

DENTAL SOCIETY MEETINGS: March, April, and May.

MARCH.

Oklahoma State Dental Association. Oklahoma City. Five days: March 15th to 19th.

APRIL.

Connecticut State Dental Association. Hartford. Three days: April 20th to 22d.

Kansas State Dental Association. Topeka. Three days: April 27th to 29th.

Michigan State Dental Society. Grand Rapids. Three days: April 15th to 17th.

Mississippi Dental Association. Jackson. Three days: April 20th to 22d.

Odontological Society of Western Pennsylvania. Pittsburgh. Two days: April 13th and 14th.

South Carolina State Dental Association. Columbia. Four days: April 27th to 30th.

Southern Minnesota District Dental Society. Mankato. Three days: April 12th to 14th.

MAY.

Dental Society of the State of New York. Albany. Three days: May 13th to 15th.

Illinois State Dental Society. Peoria. Four days: May 11th to 14th.

Indiana State Dental Association. Indianapolis. Three days: May 18th to 20th.

Lake Erie Dental Association. Cambridge Springs, Pa. Three days: May 20th to 22d.

Massachusetts Dental Society. Boston. Three days: May 5th to 7th.

Susquehanna Dental Association of Pa. Wilkes-Barre. Three days: May 18th to 20th.

Texas State Dental Association. Galveston. Four days: May 19th to 22d.

Examiners' Meetings.

Massachusetts Board of Registration. Boston. Three days: March 3d to 5th.

OKLAHOMA STATE DENTAL SOCIETY.

The next meeting of this society will be held in Oklahoma City, March 15, 16, 17, 18, and 19, 1915.

The meeting will be conducted somewhat along the same lines—the postgraduate plan—that has proved so valuable in this state the past few years.

The principal lecturers will be Drs. J. H. Prothero and W. H. G. Logan of Chicago. Dr. Prothero's lectures will be confined to important phases of prosthetic dentistry, while Dr. Logan will give lectures on modern methods of treating pyorrhea and on local anesthesia.

Reputable dentists from out of the state are welcome to this meeting, but are required to pay a fee of five dollars for the lectures and clinics.

C. R. Lawrence, *Sec'y*,
Enid, Okla.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA.

The thirty-fourth annual meeting of the Odontological Society of Western Pennsylvania will be held at the Monongahela House, Pittsburgh, Pa., Tuesday and Wednesday, April 13 and 14, 1915.

The first regular session of the society will open on Tuesday at 10.30 A.M. The Executive Council will meet at the hotel at 10 A.M. for the transaction of business in the interest of the society.

The clinics and exhibits will be at the Monongahela House. Exhibitors are cordially invited to visit this meeting, and requested to make early reservation for space. Address Dr. Leslie Waddill, Jenkins Arcade, Pittsburgh, Pa.

A cordial invitation is extended to all ethical dentists in Pennsylvania and adjoining states.

King S. Perry, *Sec'y*,
719 Jenkins Bldg., Pittsburgh, Pa.

SECOND DISTRICT (N. Y.) DENTAL SOCIETY.

You are invited by the Second District (N. Y.) Dental Society to attend a dinner and meeting on Monday evening, April 12, 1915, in the new Hotel Bossert, Brooklyn, N. Y.

Reserve this evening for a meeting that will signalize a marked advance in scientific dentistry. Dr. Elmer S. Best of Minneapolis, Minn., will read his paper on "The Responsibility of the Dentist in Pulpless Teeth." This is the result of over two years' experiment, study, and trial. Some of the ablest men in the medical and dental professions will discuss this problem.

The dinner, an informal one, will be $ per person. Tables for six and eight will be reserved upon receipt of check made payable to Arthur M. Hunter, treasurer of the dinner committee, 67 Hanson Place, Brooklyn.

A. M. Nodine, *Chairman*,
F. C. Walker,
A. H. Hunter, *Committee*.

MICHIGAN STATE DENTAL SOCIETY.

The next meeting of the Michigan State Dental Society will be held at Grand Rapids, April 15, 16, and 17, 1915.

F. Ward Howlett, *Sec'y*, Jackson, Mich.

MISSISSIPPI DENTAL ASSOCIATION.

The fortieth annual meeting of the Mississippi Dental Association will be held in Jackson, April 20, 21, and 22, 1915.

M. B. Varnado, *Sec'y*, Osyka, Miss.

SOUTH CAROLINA STATE DENTAL ASSOCIATION.

Note Change of Date.

The annual meeting of the South Carolina State Dental Association will be held at the Jefferson Hotel, Columbia, S. C., April 27 to 30, 1915.

Special public session, devoted to the relationship of defective teeth to the public health, will be held in the afternoon and evening of April 29th.

P. D. Brooker, *President*,
Columbia, S. C.
E. C. Dye, *Sec'y*,
Greenville, S. C.

CONNECTICUT STATE DENTAL ASSOCIATION.

The fifty-first annual meeting of the Connecticut State Dental Association will be held at Hartford, Conn., April 20, 21, and 22, 1915.

Charles H. Riggs, *President*,
Hartford, Conn.
Elwyn R. Bryant, *Sec'y*,
New Haven, Conn.

KANSAS STATE DENTAL ASSOCIATION.

The Kansas State Dental Association will hold its next annual meeting at Topeka, Kans., April 27, 28, and 29, 1915.

A most unique program will be presented. Dr. Thos. P. Hinman of Atlanta, Ga., will be the guest of honor.

A. L. Benton, *Sec'y*,
Garnett, Kans.

SOUTHERN MINNESOTA DISTRICT DENTAL SOCIETY.

The Southern Minnesota District Dental Society will hold its annual meeting April 12, 13, and 14, 1915, at Mankato. A literary and clinical program will be carried out.

G. W. Norbis, *Sec'y*,
Tracy, Minn.

TEXAS STATE DENTAL ASSOCIATION.

The thirty-fifth annual meeting of the Texas State Dental Association will be held in Galveston, Texas, May 19, 20, 21, and 22, 1915. The special feature of this meeting will be postgraduate lectures and clinic work.

Dr. G. Walter Ditmar of Chicago will present modern scientific bridge work and removable partial dentures, with preparations, technique, and principles involved. Dr. B. F. Thielen will present "Plate Work." Dr. T. G. Duckworth, "Orthodontia." Dr. R. D. Griffis, "Nitrous Oxid Analgesia and Anesthesia." Dr. Julian Smith, "Pyorrhea." Dr. J. M. Murphy, "Local Anesthesia."

Exhibitors are requested to attend, and to write to Dr. A. L. Frew, Dallas, for space. General clinics, on last day. Clinicians will write Dr. W. H. Nugent, Fort Worth. For any other information write the secretary.

C. M. McCauley, *Pres.*, Dallas.
W. O. Talbot, *Sec'y-Treas.*, Fort Worth.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE forty-seventh annual meeting of the Dental Society of the State of New York will be held at Albany, N. Y., Thursday, Friday, and Saturday, May 13, 14, and 15, 1915.

The Executive Council will meet at the Hotel Ten Eyck, Wednesday afternoon, May 12th, at 3 P.M., for the transaction of business.

The first regular session of the society will open on Thursday at 10.30 A.M. The literary program will be rendered in the auditorium of the Educational Building. Headquarters for Officers and Executive Council will be at the Hotel Ten Eyck.

The clinics and exhibits will be at the Hotel Ten Eyck. Exhibitors are cordially invited to visit this meeting, and requested to make early reservations for space. Address Dr. O. J. Gross, Schenectady, N. Y., for space.

A cordial invitation is extended to all ethical dentists in New York and sister states.

A. P. BURKHART, *Sec'y*,
52 Genesee st., Auburn, N. Y.

ILLINOIS STATE DENTAL SOCIETY.

THE fifty-first annual meeting of the Illinois State Dental Society will be held at Peoria, May 11, 12, 13, and 14, 1915.

J. N. BARCUS, *President*,
HENRY L. WHIPPLE, *Sec'y*.

LAKE ERIE DENTAL ASSOCIATION.

THE fifty-second annual meeting of the Lake Erie Dental Association will be held at Hotel Bartlett, Cambridge Springs, Pa., May 20, 21, and 22, 1915.

J. F. SMITH, *Sec'y*,
Erie, Pa.

INDIANA STATE DENTAL ASSOCIATION

THE next annual meeting of the Indiana State Dental Association will be held in Indianapolis, on May 18, 19, and 20, 1915. A distinctive feature of this meeting will be that the program will be made up exclusively of Indiana dentists. A cordial invitation is extended to members of other dental societies to attend the meeting.

A. R. ROSS, *Sec'y*,
Lafayette, Ind.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA.

THE fifty-second annual meeting of the Susquehanna Dental Association will be held at Irem Temple, Wilkes-Barre, Pa., May 18, 19, and 20, 1915.

GEO. C. KNOX, *Recording Sec'y*.

MASSACHUSETTS DENTAL SOCIETY.

THE fifty-first annual meeting of the Massachusetts Dental Society will be held May 5, 6, and 7, 1915, in the Hotel Somerset, Boston, Mass.

A. H. ST.C. CHASE, *Sec'y*.

LOUISIANA STATE DENTAL SOCIETY.

THE next Louisiana State Dental Society meeting will be held in New Orleans, La., June 3, 4, and 5, 1915, at the Grunewald Hotel.

P. W. TROWBRIDGE, *Sec'y*.

NORTH CAROLINA DENTAL SOCIETY.

THE next annual meeting of the North Carolina Dental Society will be held at Wrightsville Beach, June 23, 24, and 25, 1915.

R. M. SQUIRES, *Sec'y*,
Wake Forest, N. C.

NEW HAMPSHIRE DENTAL SOCIETY.

THE next meeting of the New Hampshire Dental Society will be held at the New Hotel Weirs, Weirs, N. H., June 22, 23, and 24, 1915.

C. S. COPELAND, *President*,
L. I. MOULTON, *Sec'y*.

MISSOURI STATE DENTAL ASSOCIATION.

CHANGE OF DATE OF MEETING.

THE Golden Jubilee meeting of the Missouri State Dental Association has been postponed until June 10, 11, and 12, 1915. Elaborate preparations are being made to celebrate the semi-centennial meeting of this association on an elaborate scale. See special announcements in the next issue of this journal. For information address

S. C. A. RUBEY, *Sec'y*,
1017 New York Life Bldg., Kansas City, Mo.

MASSACHUSETTS BOARD OF REGISTRATION.

A MEETING of the Massachusetts Board of Registration will be held in Boston, March 3, 4, and 5, 1915. For applications and further information apply to

G. E. MITCHELL, *Sec'y*,
14 Water st., Haverhill, Mass.

SOUTH CAROLINA BOARD OF EXAMINERS.

THE next annual meeting of the South Carolina State Board of Dental Examiners will be held at Columbia, S. C., beginning at 9 A. M., Tuesday, June 15, 1915.

All applications must be in the hands of the secretary not later than June 5th. Application blanks and instructions from

R. L. SPENCER, *Sec'y*,
Bennettsville, S. C.

EXAMINATION OF DENTISTS FOR THE U. S. ARMY.

THE Surgeon-general of the army announces that examinations for the appointment of acting dental surgeons will be held at Fort Slocum, New York; Columbus Barracks, Ohio; Jefferson Barracks, Missouri; Fort Logan, Colorado; and Fort McDowell, California, on Monday, April 12, 1915.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S. Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and twenty-seven years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Acting dental surgeons are employed under a three years' contract, at the rate of $150 per month. They are entitled to traveling allowances in obeying their first orders, in changing stations, and in returning to their homes at termination of service. They also have the privilege of purchasing certain supplies at the army commissary. After three years' service, if found qualified, they are promoted to the grade of dental surgeon, with the rank of first lieutenant, and receive thereafter the pay and allowances appertaining to that rank.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination. Early attention is therefore enjoined upon all intending applicants. There will be nine vacancies to be filled.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING JANUARY 1915.

January 5.

No. 1,123,830, to ERIC ZINCKE and CLINTON H. BULL. Dental cabinet.

No. 1,124,099, to WILLIAM A. ADAMS. Dental casting apparatus.

January 12.

No. 1,124,299, to ALBERT B. COSAD and CHARLES F. WISE. Dental saliva tube.

No. 1,124,498, to CHARLES W. MILLAR. Dental inlay holder.

No. 1,124,728, to JAMES F. HARDY. Dental broach-cutting machine.

January 19.

No. 1,125,168, to FRANK E. PERKINS. Right-angle handpiece.

No. 1,125,532, to EARL HIMMEL. Tooth-brush.

No. 1,125,576, to MORTON MAIER. Bridge measuring device.

DR. HENRY B. McFADDEN

THE

DENTAL COSMOS.

VOL. LVII. APRIL 1915. No. 4.

ORIGINAL COMMUNICATIONS.

DENTAL AND FACIAL PROSTHESIS IN THE PHILIPPINES:

Prosthetic Noses, Upper Lips, Lower Lip, Ear, Eyes, and Obturator.

By LOUIS OTTOFY, D.D.S., Manila, P. I.

(Report presented to Section VII of the Sixth International Dental Congress, London, 1914.)

IN 1905 I reported a case of an "Artificial Nose for a Chinaman," which was published in the May 1905 issue of the DENTAL COSMOS. As I desire to have all the prosthetic cases of this nature made by me up to the present time published *en groupe,* I here insert the article with the illustrations:

"Wee Cheong, the subject of this article, claims to have lost his nose when he was a child, as the result of a blow inflicted by a playmate. There is nothing extraordinary about the substitute which I made for him, except that it is the first work of this kind in the Philippine Islands, and possibly the first substitute of its kind ever made for and worn by a native of the celestial kingdom.

"The substitute is retained in position by the spectacles above and by two small rubber hooks extending into the nostrils below. It is made of vulcanite and has been artistically painted by a famous native portrait artist. He has reproduced the color—a muddy yellow—to perfection, and added some of the defects of other portions of the face in the form of discoloration of the skin, which, however, does not show in the illustrations.

"The photographs (unlike most of those which I have seen) from which the illustrations (Figs. 1, 2, 3, and 4) are made have not been retouched in the slightest degree, and the partly imperfect adaptation of the lower portion of the piece is shown as it really exists. This is due to the fact that the remains of the nostrils are very small, and admitted of but little attachment. Within ten feet the substitute cannot be recognized, and it is, indeed, discernible only on close inspection, the deception being aided by the fact that of all things the last to look for on a Chinaman's face is an artificial nose. The man without the piece is extremely repulsive.

"Anyone who is observant will have noticed in Manila that such injuries as

Fig. 1.

Fig. 2.

the loss of arms and legs are extremely rare, due to the absence of factories, no night trains. On the other hand, repulsive defects of the face, the loss of large portions of the soft tissues, including the nose, hare-lip, etc., seem to be

Fig. 3.

Fig. 4.

street-cars, railroads, etc. The only railroad in the islands runs its trains slowly, and only in daytime, there being met with greater frequency. I am of the opinion that this is not necessarily due to a larger number of these cases, but

to the fact that no remedy is applied, and the loss sustained is often greater than would be the case in almost any part of the United States or elsewhere where surgical aid would intervene. Practically nothing has been done here to remedy hare-lip in early age; and other affections of the face usually terminate by exhaustion rather than surgical or medical interference."

In connection with this case it is only just to state that the observation I made to the effect that this is the first case of an artificial (prosthetic) nose made for a Chinaman, or in the Philippines, is, in view of subsequent information, not correct—albeit it is, so far as I know at the present time (1914), the first practicable and serviceable case.

A Chinaman who has seen the photographs from which the above illustrations were made, informed me that he knew one of his countrymen for whom an artificial nose was made by a Filipino dentist. After considerable search the man was found, and he had in his possession an artistic substitute, carved of wood, very light, and of excellent form and color. It was intended to be retained *in situ* in the lower part by a metal screw which extended into the nostrils, and for retention on the bridge of the nose it depended on some sticky substance; at the time the piece was given to me, the substance last used was shoemaker's wax. The Chinaman stated that he could not keep it in place with any kind of wax, as in this climate the wax would soften or melt, and for that reason the substitute was of no practical value.

Finally, another interesting point which may be mentioned in connection with Wee Cheong's case is this: He went to Amoy, China, for the New Year's festivities, as many of the Chinamen are wont to do annually. Finding a friend who was minus a nose, Cheong sold his own nose to him, trusting that on his return I would make another nose for him, like the first one—gratis. This I at first declined to do, and by the time I repented, inquiry developed the fact that Wee Cheong had returned to China to live and eventually to die among his countrymen.

Including the above case, I record in this report seventeen cases of prosthesis of various nature, made for sixteen individuals, as follows:

	Cases.
Prosthetic noses	9
" upper lips	3
" eyes with surrounding tissues	2
Prosthetic lower lip	1
" ear	1
Obturator for cleft palate	1

I trust a description of these cases will be of interest; they certainly indicate to what extent the results of civilization have penetrated into remote sections of the world. Some of these substitutes are worn by people who less than a generation ago were hardly known to the white man.

Prosthetic Nose No. 2.

This is a Filipino fisherman of Malabon, Rizal province; September 1908. In this case, as in all others, it is impossible to ascertain the cause of the disease which resulted in the loss. I am of the opinion that they are not of a syphilitic nature (except case No. 8), but that they are the result of some type of lupus. This man is forty years of age, and states that when he was twenty a sore appeared on one of the alæ of the nose, and that this continued to spread and spread, and that for nearly three years the process of destruction continued, until it involved the entire nose, mouth, lower part of the face, and the palate. The condition at present shows the total loss of the nose, cicatrization of a considerable part of the face, and destruction of the lips to such an extent that the attempt to open the mouth results in a round orifice the size of an American quarter-dollar. A cleft extends through the entire palate, three-quarters of an inch in width, with loss of the uvula and the entire upper denture.

I arranged with a surgeon to extend the opening of the mouth at the angles,

and also arranged for free care of the man at a hospital, it having been my intention to make for him an obturator and upper denture when the mouth should be enlarged for that purpose. The man, however, was timid, and fear led him to forego the operation, although he was assured that it would be painless.

Fig. 5.

Fig. 6.

The first nasal substitute I made for him was retained in place by gold springs which extended into the nostrils. But when the springs were tightened so as to hold the piece firmly against the

Fig. 7.

Fig. 8.

face, the margins of the orifice were irritated, and when the pressure of the springs was released the piece could not be retained in place. Hence the nose shown in the illustration is held firmly in position by a hook of vulcanite below, and by the spectacles above. None of these or of the preceding and succeeding photographs are retouched, or in any way altered or improved, so that they indicate, as nearly as the camera can reproduce them, the improvements as well as the defects. (See Figs. 5, 6, 7, and 8.)

Prosthetic Nose No. 3 and Lower Lip.

This case is an exceedingly interesting one. These substitutes were made in October 1909, at Daet, Ambos Camarines province. The woman, Apolonia Panotes, was forty-five years of age, married, and claimed that twenty-one years ago she was attacked with a disease, which ran its course, and left the ravages only imperfectly shown in the pictures —unsatisfactory photographs which I obtained through a native photographer. Such a diagnosis is very unsatisfactory, but it is the best obtainable. This case is especially interesting because of the remarkable improvement in the appearance of the patient, notwithstanding the imperfect transmission of the improvement in the full-face view. A face minus the nose is in itself a painful sight to behold, but in the case of this woman the loss of the lower lip made her appearance hideous, reminding one of the dead.

The accompanying illustrations give a full face and a profile view, with and without the substitutes. The photographs cannot convey the hideousness in its full enormity, because, in the first place, the skin of the entire face except the forehead is covered with ugly blotches, having on the dark-brown background of the Filipino skin, rings and circles of what appear to be cicatrices, such as I have seen as the result of prairie fires in the territory of Dakota, years ago; they are white and red blotches, in places running into each other, so that there is really no distinguishable color, except that the native

Fig. 9.

brown prevails. The eyelashes are absent, in one of the eyes the sight is wanting, the cornea is white and bulg-

Fig. 10.

ing, while in both of the eyes the conjunctiva is intensely hyperemic.

There are no remains of the nose or

nostrils and there seems to be no cicatrix to indicate that she ever had a nose.

Fig. 11.

In place of the nasal organ there is merely a depression. All the upper

Fig. 12.

teeth are missing. Beginning at the angle of the mouth, the lower lip is missing, the loss taking a semilunar form, so that at the median line (the deepest part) the loss extends down one inch from where the margin of the lip should be. By reason of exposure to the air the gums have receded until the teeth are denuded of gum and bone to the apices of the roots. No one can see the face for the first time without experiencing a most disagreeable shock. (See Figs. 9, 10, 11, and 12.)

The substitutes are made of vulcanite, the nose being held in place above by the spectacles and below by a small vulcanite hook, which follows the median line across the upper lip and extends into the mouth. The lower prosthetic lip is held in place by two gold hooks, which clamp on the lower canines and hold the piece firmly in position and in apposition with the margins of the living tissues. In this case I feel that the actual improvement is not truthfully reproduced by the camera.

When the substitutes were completed I was sorely disappointed, for the improvements in her appearance did not coincide with my previously conceived mental picture. However, replacing the white glass of the spectacles with amber-colored glass yielded a satisfactorily result, inasmuch as they concealed from view the hideously grotesque eyes.

I was subsequently informed that this woman had confined herself to the house for so many years that on the first attempt to walk the streets for the purpose of attending church, a privilege so long denied her, she had to be supported.

Prosthetic Nose No. 4.

This is a case of a Filipino laborer in Tuguegarao, province of Cagayan; May 1910. In this, as in the others, there is no reliable history. Whatever the cause, the consequences are shown to be serious. The nose is gone, the face is badly cicatrized, the lips are extroverted, and what is the most repulsive of all (not shown without color) is the loss of the eyelashes and the extroversion of the lower lids of the eyes. They are chronically inflamed, excessively red and watery.

In this case I used large smoked

crystals in the spectacles, which concealed all the ugliness of the eyes: the spectacles also hold the nose in place above, while below it is held in place by a hook which passes into the nostrils. Unfortunately, when the case was finished, the copious rains and storms prevented the taking of the pictures, and hence I have been obliged to rely on drawings, which quite fairly reproduce the results attained. (See Figs. 13, 14, 15, and 16.)

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Prosthetic Nose No. 5.

This is the case of a poor native at Hagan, province of Isabela; May 1910.

Fig. 17.

Fig. 18.

Fig. 19.

Fig. 20.

His face is deeply marked, not unlike smallpox, and the remnant of the nose resembles a strawberry, but is really a warty, ugly substance. The profile resembles an ape. For want of time the photographs were taken while the paint was fresh, and when the brilliancy due to the reflection of the light from the paint has moderated, the improvement will be accentuated. The substitute is made of vulcanite, held in place above by the spectacles and below by a hook

of vulcanite which extends into the nostrils, passing under the wart-like remnant of the nose. (See Figs. 17, 18, 19, and 20.)

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Prosthetic Nose No. 6.

This is also a poor Filipino, living in Malabon, Rizal province; September 1910. His case, and the next two, present no special features. The nose is held in place by the spectacles and below by a hook which passes into the remnant of the nostrils. Two of the views are from drawings. (See Figs. 21, 22, 23, and 24.)

Prosthetic Nose No. 7.

This is another poor Filipino, a charity case at the Philippine General Hospital, Manila, October 1911, where he had been operated on. (See Figs. 25, 26, 27, and 28.)

Prosthetic Nose No. 8.

This is also a native. He was driving a public vehicle on the streets of Manila. I picked him up and made the piece for him. He is the only one who was in an actively diseased condi-

Fig. 25.

Fig. 26.

Fig. 27.

Fig. 28.

tion at the time of making the prosthetic substitute; November 1913. He has a remarkable protrusion of the lower lip, for which there is no remedy. (See Figs. 29, 30, 31, and 32.)

Fig. 29.

Fig. 30.

Fig. 31.

Fig. 32.

Prosthetic Nose No. 9.

Filipino; Manila, February 1914. This man is a carrier for one of the Spanish dailies. In this as in the other cases, there is no reliable history. His face is exceedingly repulsive, because the cicatrization of the remnant of the nose left it in an irregular wart-like condition. Furthermore, the injury extends to and includes a considerable portion of the upper lip. The cicatri-

zation above the lip is such that he is unable to close the mouth, the upper lip being contracted in a semilunar shape, exposing a gap whence he lost the left central and lateral incisors. At first I extended the vulcanite of which the nose is made, down over the upper lip to fill out the spaces lost from it, but I found that the mobility of the lip in speaking made this impracticable, hence the nose is, as in the other cases, held in place by the spectacles and a hook of vulcanite extending into the nostrils. Fortunately, an exceptionally good color was

Fig. 33.

Fig. 34.

Fig. 35.

Fig. 36.

secured, and the insertion of artificial teeth improved his appearance, because his mouth is perforce always open, exposing now the teeth in place of the former gap.

I made some interesting observations with this man to note to what extent such injury or substitute is observed by people who pass him on the street. I had him walk along ahead of me on the crowded street without the substitute, and watched the faces of those who passed him. Excepting people who were interested in the show windows, engaged in conversation, or otherwise preoccupied, hardly a person passed him who did not take a fleeting notice of his deformity. The faces of many, especially those of the women, had passing over their countenance a momentary expression of pity or revulsion, and they would suddenly turn their faces away.

Then I had him put on the substitute, and I followed him until about an equal number of people had passed him. Not the slightest notice of him was taken by anyone; he moved along in the throng as one of his own people and as one just like them. Then I stopped with him on the sidewalk in such a way that we obstructed the pedestrians, and while some looked at him with an expression of annoyance, I am certain no one took notice of his deformity or its artificial remedy. I take it that this is not due so much to the perfection of the substitute as to the fact that people naturally are not looking for "false" noses, ears, or lips. Sometimes one may be suspicious of a glass eye, or of artificial teeth, because they are more common, and I apprehend that often suspicion may have good foundation when it comes to a substituted complexion or hirsute adornment. (See Figs. 33, 34, 35, and 36.)

In one of the cases described in this paper, after several times calling the attention of an intelligent gentleman to the face of a man who stood in a good light some ten feet away, and whose physiognomy was at the time adorned with a prosthetic nose, the gentleman finally did notice that "There is something strange about that man's nose." But he was unable to decide just what it was, never having heard of such a thing as a "false" nose; and of all places he would not have been looking for one in so far out of a way place as Manila, and certainly not in the case of a man whose appearance denoted him to belong to the lower and poorer strata of the community.

Prosthetic Upper Lip No. 1.

This case is that of a Filipino youth, age eighteen, Policarpo Calderon, residence Echague, province of Isabela; substitute made at Ilagan, same province, June 1910. This is one of the most repulsive cases I have ever seen. It did not occur to me to have profiles made of his features—unfortunately, as the enormous protrusion is not well shown in the full-face view, nor is the improvement made by the substitute as apparent. The division superintendent of schools, an American—who, by the way, suggested the mustache—stated that the photographs do not convey a correct idea of the enormity of the disfigurement, nor justly present the result of the improvement. This is due to the fact that the photographs do not show the receded, raw, and bleeding gums, the oozing saliva, the filthiness of the teeth, the dribbling at the corners of the mouth, and—as might have been shown in a profile view—the extreme protrusion of the teeth. While the photograph of the finished case shows the prosthetic piece as being apparently white in color, it is in fact a pink-brown, corresponding with the color of the skin. The white appearance of the prosthetic lip is, I think, due to the fact that, it being necessary to have the photograph taken while the paint was fresh, it reflects the light, giving it a luster it does not possess when viewed by the eye. Because the photograph was taken shortly after the lower teeth were extracted, the sockets of the teeth, which are located in the lower lip, are also visible. Those who had formerly seen the young man passing along the street did not believe that such a transformation could be made until they were actually convinced.

His story is as follows: When he was six years of age he bought some native candy which, it was subsequently supposed, contained some poison. In any event, within a week after eating the candy a sore appeared on the upper lip, and this continued to spread, involving more and more of the tissues, the lips and mouth becoming enormously swollen. The disease continued for a year, when it subsided, with the result shown. (See Figs. 37 and 38.)

Fig. 37.

Fig. 38.

On examination it will be found that the left ala of the nose is lost, and the lips at the angles of the mouth are cicatrized so that he can open the mouth to so limited an extent that in the region of the first bicuspids the separation of the lower from the upper teeth is possible only to the extent of a quarter of an inch. While his speech is understandable, articulation is indistinct. Above and below the remnants of the lips, the gums and teeth and the maxillary bones and the mandible are as one; so that the appearance is as though the teeth had grown out of the lips, which are of a dirty brown mixed with the original pink color of the lips. In the lower jaw the right lateral incisor contained a dead pulp and was discolored; the right lower central incisor had decayed so that there was only the root left. In the upper jaw the teeth were irregular and exceedingly protruding, unfortunately not well shown in Fig. 37.

At first it was my intention to make an upper and a lower lip, but after extracting the four lower incisors and the lower left canine and first bicuspid the improvement was so marked that I decided to do nothing more about the lower lip, as I was of the opinion that after the usual absorption of the process and the healing of the wounds, the lower lip would be fairly presentable.

In the upper jaw I ground off the prominent portions of the central incisors and of the left canine, thus materially reducing the protrusion. Had there been some other dentist with whom to divide the responsibility I would have removed some of the upper teeth. It must be understood that this case was under my care away up in the interior of the country, among people who are more or less superstitious, and any untoward symptom, such as profuse hemorrhage or some slight fracture of the alveolar process, might have resulted seriously—that is, personally to me—as I shall prove shortly in connection with

the relation of something that happened a few days later at this same place.

The upper lip was made to fit a model from a plaster-of-Paris impression, and is firmly held in position by means of gold caps which fit over the right canine and left first bicuspid, the caps being vulcanized into the rubber. As I have never before made a mustache, the result was not quite satisfactory. In the first place I could not get any black beard hair of a sufficient length in the town, and hence I bought a few curly locks from a Negrito—one of the aborigines of the islands, uncivilized and non-Christian, some of whom happened to be in town. But as they were probably not pure Negritos, the hair was not kinky and stiff, but smooth, wavy, and long. As I could not get enough of this hair, it had to be pieced out with the head hair of the native himself; this was straight and oily, and not easy (for me) to sew on to the gauze, which in turn was sewed to the prosthetic lip. Later I had a mustache made by a wig-maker, with better result, and sent it on. The mustache conceals the margin between the piece and the living tissues.

As some of the photographs preceding and some of those to follow do not represent high skill in the photographic art—and in fact in some instances no photos could be secured at all—with also the difficulty of making Chinese or native photographers understand just what was wanted, I show [see footnote] a photo taken in a case in which the Chinese photographer was requested to photograph only the mouth, and make it "plenty big," so as to show the deposit on the teeth as plainly as possible. He assured me that it would be "velly big"—with the result that not only are the woman and I in it, full size, but considerable of the surrounding scenery as well! As to showing what I actually wanted, its value is almost *nil*.*

However, it will not be out of place to describe what I vainly desired to illustrate. This is the case of a Kalinga woman whom I happened to meet on the street. These people live in the mountains, are partly civilized, and make occasional visits to the near-by towns for the purposes of trade. They resemble the Igorots, Ifugaos, Ibanaos and other similar tribes, which, though differing from each other, have something in common. The Kalingas blacken their teeth with a product made from the bark of a tree. The acidity of the material roughens the teeth as they chew it, and then intensely black, shiny coats, one after another, become deposited, until the teeth are as black and as polished as anthracite coal. In the case of this woman—and I was informed it is common among the women—when the lips are closed and at rest there is a thick, black, rounded line visible from one angle of the mouth to the other, which is considered by them to be *very pretty*. On closer examination I found that there was a heavy deposit, or rather a building up, out of this substance, extending from canine to canine in the upper jaw; it was so uniform and smooth that I felt positive that it could not have been built up with a semi-plastic substance which afterward hardened, but that it must be held in place by a wire, or some fiber of a plant, which was embedded in it.

The Hon. Dean C. Worcester, who is an authority on the non-Christian tribes of the Philippines and who has carefully described the customs of these people, and other persons who have also studied these and other wild tribes, have made no reference to this building-up of the deposit—possibly not observing it as a dentist would do. A Spanish gentleman, who was conversant with their dialect, kindly obtained this information for me: The women first grind the labial surfaces of the upper anterior teeth with a stone, until the teeth are concave, then they carefully build up this deposit, layer by layer, as it hardens, until it assumes the proportions and shape mentioned. Furthermore, they are exceedingly proud when the result is an even line between the lips, and they take good

* [For which reason the picture—No. "39" of Dr. Ottofy's series—is not reproduced in the DENTAL COSMOS.—ED.]

care not to injure it. With a magnifying glass the deposit may be readily seen. Something that seems white in the mouth is a view not of the teeth but of the gums.

For the permission to take the picture, the interpreter told me that she and her party would have to have a drink of gin at my expense, to which I consented—ignorant at the time of the fact that there is a law against giving or selling intoxicants to members of any of the wild tribes. After the gin I induced the interpreter to ask her to permit me to take an impression—with which quite a quantity of this carefully made deposit, in which so much pride was taken, came away with the plaster-of-Paris. It left the deposit rough and irregular, and the "beauty" of her years of care and labor was destroyed! When she made the discovery of the damage there was some warm, indeed hot, Kalinga lingo passing back and forth between her and her five companions, three of whom were men. Remembering that it was not far from where I then was that Professor Jones of the Field Columbian Museum of Chicago, in quest of scientific data, was killed, not so very long before that time, for some indiscretion against these same people, I promptly suggested more gin, had the drinks made of double the quantity, and while it was taking effect I somehow disappeared, and curiously enough my whereabouts was unknown until the wildly gesticulating and threateningly muttering Kalingas had left the town. Next morning I learned that they left under considerable sense of provocation, while the woman had her fingers in her mouth, making digital examination of the damage.

Prosthetic Upper Lip No. 2.

This is the case of a Filipino laborer on the sugar plantation of Welch, Havemeyer & Fairchild, on the estate at San José, island of Mindoro, about which there was some sensational U. S. Congressional investigation in connection with the "Friar lands," some years ago. The man was about twenty-five years of age when this piece was made for him, in August 1913.

Fig. 40.

Like the others, he could give no reliable information. It appears that he had suffered some injury, but of this he

Fig. 41.

knows nothing. His right eye had been wounded, so that it is sightless; the eyeball having never been removed, there

is a constant dribbling of the lacrimal fluid down his cheek beside the nose, where there is also a scar which is continuous from the inner angle of the eye to the upper lip, where it terminates in an inverted V-shaped (∧) loss of the upper lip, exposing the right upper canine and lateral incisor. The ugly appearance of the eye was made less unsightly by the use of amber-colored glasses, while the split in the lip was covered by a vulcanite piece, made much like that in the foregoing case, except that one gold cap fitting over the exposed canine was sufficient to hold the piece firmly in place. As he was a small, wizened fellow, a slight mustache sewed on as in the previous case covered the margin between the prosthetic substitute and the natural tissues. (See Figs. 40 and 41.)

There were two incidents in connection with this case which if not instructive are at least interesting; one of them I will mention here, and the other in connection with the next case. This man received as his wages about 80 centavos (40 cents U. S. currency) per day. While this seems very small, it is ample to feed and clothe himself and to leave a small sum for comforts and luxuries. But, like so many Filipinos—to whom, by the way, gambling is a national curse—he is a gambler, and for that reason, while his ruptured trousers exposed a considerable part of the gluteal region, yet, barely was this improvement of his features made when his first purchase at the general store of the company was—a bottle of perfume!

Prosthetic Upper Lip No. 3.

This is the case of a market woman found at the same place and at the same time as the above. As the pictures show (see Figs. 42 and 43), her eyes and face are perfect except for the loss of a portion of the upper lip on the right side. In fact, the case is merely one of harelip too large to be surgically closed. The loss is not quite so extensive as in the previous case, but sufficient to expose two of the teeth. The substitute was made identically as in the previous case, omitting of course the mustache,

Fig. 42.

but for that reason the margin between the prosthetic and the natural lip is

Fig. 43.

more apparent. Her deformity led her to seek seclusion as much as possible, so that her work lay in the farthest corner

of the market, and was mostly of a nature which caused her back to be turned toward the customers who frequented that stall.

One of the incidents referred to in the previous case is connected with this woman. While I was at San José, as an indication what our rainy season is in sections where it rains much, and where indeed it is needed for the luxurious crops of tropical vegetation, I may say that during the seventeen days I was there the rains continued, or the skies were overcast with clouds, except twice for brief periods—once, before I made the two cases just described, the second time in the afternoon of the day on which I left. Hence it was impossible to get any photographs of these cases. The artist, with the descriptive aid of one who knew and had seen both cases, has given a fair representation of the injury and the improvement, though not of the general appearance of the individuals. I was promised photographs of them as soon as it would be clear enough to make the negatives, but in the meanwhile both left the plantation and married each other! They drifted to some other island, on which, as my informant states, "They are probably living in bliss, planting kiss upon kiss, with loving lips, and yet not lips."

The prosthetic lower lip has been described in connection with prosthetic nose No. 3.

Prosthetic Ear.

This is a very simple case. (September 1910.) Prior to the American occupation, fifteen years ago, there were many cruelties practiced by the natives upon their enemies as well as upon each other in times of disturbance, much as I apprehend is the case in Mexico. Among them was the cutting-off of an ear of one suspected to be a traitor, or one who had shown sympathy with the opposing faction. It was thus that this old man lost his ear. Whether justly mutilated or unjustly I do not know, but he was ashamed of the loss, and usually wore a handkerchief tied around his head.

The ear is made of vulcanite, painted to match his skin, and is held in place by small vulcanite projections which extend into the aural opening. The model

Fig. 44.

Fig. 45.

for the right ear was secured from the impression of the ear of another man whose ears in size and shape corresponded with the left ear of this patient. (See Figs. 44 and 45.)

Prosthetic Eye No. 1, with Surrounding Tissues.

This is the case of a poor Filipino (January 1912), a patient at the Philippine General Hospital eye, nose, and ear clinic in charge of Dr. Rembe. I do not know what the disease was, as shown in Fig. 46, which led to the cleaning-out of the socket of the eye and the removal of portions of the surrounding tissues, as shown in Fig. 47, but the improvement made is apparent from the next illustration, Fig. 48. The piece is made of vulcanite and was very artistically painted by one of the students of the School of Arts. I found within the socket a slight depression in the region of the former lacrimal duct, and also opposite at a point which corresponds

Fig. 46.

Fig. 47.

Fig. 48.

with the outer angle of the eye. The vulcanite extending into these depressions held the piece in place, but as he was obliged to wear a glass on account of some defect of the right eye, the spectacles, by pressure on the piece against the bridge of the nose, and at a point on the temples, aided in keeping the piece firmly in place. The eye is an ordinary glass eye matching the natural one, and is secured in place by means of projections of the vulcanite and silver wire, in the interior of the socket. The lids and the surrounding parts of the eye were carved in the wax, and subsequently reproduced in the vulcanite. The eyebrow and the eyelashes are made of suitable hairs, embedded by means of cement into holes drilled for that purpose in the vulcanite.

Prosthetic Eye No. 2.

This is another charity case sent to me from the Philippine General Hospital, February 1914. It is similar to the previous one, but not so extensive. The piece is held in place by a projection of the vulcanite extending up under the orbital plate of the frontal bone above, and below by a projection of vulcanite into the floor of the orbit, so curved as to retain the piece in place by a slight wedge pressure. The selection from artificial eyes is somewhat limited in this city, and I could find none which was not too large to insert into the limited space left in the rear part of the vulcanite. It occurred to me then to make use of an eye intended by the taxidermist for use with birds and animals. The natural eye of this man is dull, and the white part is of a muddy brown color. It so happened that I fastened the glass eye in the rubber and put it in the vulcanizer, unaware of the fact that the coloring matter used in these eyes is paint or something else. Whatever it is, it was melted by the heat in the vulcanizer and admirably, although by accident, reproduced the muddy and cloudy appearance of the natural eye. (See Figs. 49 and 50.)

Much of the artistic result of these cases depends on the painting of the piece. It is not an easy matter to give

Fig. 49.

a lifelike appearance to so dense a substance as hard vulcanite. In those cases

Fig. 50.

in which I was fortunate enough to have this done by a portrait painter the results were admirable. My own ability

along this line is limited. I have prepared a number of shades suitable for the various tints of the skin of the natives, and made numbered samples of them on a sheet of paper. When the piece is finished, I match the face to one of these samples and do the best I can.

Obturator for Cleft Palate.

While there is nothing unusual about this case, shown in the last four illustrations, it is interesting to note that the little girl for whom this obturator was made, in September 1913, is Ilokano and Igorot mixed blood, and comes from a section of these islands into

Fig. 51.

which white men have but rarely entered until the last fifteen or twenty years. It is no doubt a marvel to her parents and neighbors to find that such improvement can be made.

The illustrations (Figs. 51, 52, 53, and 54) almost explain themselves. Of course she had the two difficulties, as in all cleft cases, of having the food enter the nasal cavity and the impossibility of clear enunciation. The former has been entirely remedied, and the latter considerably so. As will be seen, it is a vulcanite plate extending by ridges into the cleft and by a projection into the fauces to take the place of the uvula. When last seen by me the piece had been worn but a few days, but the improvement in speech was, in the words of others, "simply marvelous." The piece is held in place by the two vulcanite hooks around the molars, and by a gold clasp passing between the bicuspids on the left side. The space where the teeth are

Fig. 52.

missing was too wide for one tooth and too narrow for two, hence there is one porcelain tooth with a gold filling, and adjoining it, where the lateral incisor

Fig. 53.

should be, some white vulcanite which later I have thought may have to be filed to allow the obturator perfect adaptation.

It may not be out of place to state here that the cases here described are purely charity cases. Only for three of them were my actual expenses paid by the Philippine General Hospital. I

have received no other compensation directly or indirectly. All of them are poor people, so poor that in one instance where I had no time to remain, I had to pay the local painter to finish the piece; for another I furnished the carfare, and for another the *banca* (rowboat) fare to cross the river, and for some food and lodging, so that the piece might be made. I do not mention this either boastingly or complainingly, but as affording one instance of the generally altruistic and charitable attitude of Americans toward the natives of these

Fig. 54.

islands. I know of many instances, along other lines of endeavor, more generous than mine.

Many Americans, seeing so many deformities of this character among the natives, especially hare-lip, which seems to be frequent, are of the opinion that the natives are more prone to these afflictions than Americans or Europeans. I am not prepared to state whether that is true or otherwise. I am inclined to think that in the more advanced sections of the United States and Europe, such ravages are not allowed to run their course until the injuries are so pronounced. Thus, hare-lip is usually remedied early in life, while a serious affliction of the face cannot proceed as a rule very far until either some friends or some charitable institution or hospital interferes. Here, especially in the provinces, inadequately supplied with medical men, it seems that such an affliction is likely to run its course until it exhausts itself. While Manila today is provided with ample hospital facilities of the best, they are wofully wanting in other sections of the islands.

In closing, it will not be out of place to mention an experience illustrative of what I have just said: While returning from the Cagayan valley in the northeastern part of the island of Luzon, a few years ago, I was fortunate enough to be on a steamer which was obliged to go out of its direct course to touch at the Batanes Islands and load some cattle. These islands are the most northerly of this group, and lie nearer to the shores of Japan's Formosa than to the island of Luzon of the Philippine Archipelago. The islands have no regular communication with others, on account of the typhoons, which cut them off from the rest of the world for prolonged periods. The natives differ from those living on the other islands of this group. They plant no rice and import none, but live on yams and *camotes* (sweet potatoes), which grow in great abundance. But little sugar-cane is cultivated, and that little is mostly used for fermenting an alcoholic beverage known as *palik*. They eat some meat, fish, and pork, but the principal diet is vegetable. During our short time in port I intended to examine and tabulate the condition of the teeth of the school children, simply because the people differ from those of the other islands, but unfortunately the public schools there had not yet opened. However, the native superintendent of schools happened to be conducting a normal school at which the teachers of the various islands which compose this small group were present, and on his invitation I addressed this class, about twenty-five young people, on dental hygiene.

I found the parochial school in session, and through the courtesy of the priest examined the teeth of about fifty of the boys and girls, but did not consider it necessary to tabulate so small a number. Mentally comparing their condition with the teeth of the Filipinos as I know them to be in Manila, and

other parts of the islands, I would say that in the Batanes Islands they are much better, and come nearer to the condition of the teeth of the Igorots (see DENTAL COSMOS, July 1908), as they are better in structure and I noted less caries, with a generally healthier condition.

Just before the ship's rowboat shoved off the shore, in turning my head and looking shoreward I beheld a sight which for the moment startled me. Apparently a corpse was unloading freight from one of the boats. I was under the impression that I had seen some interesting cases of the loss of parts of the face, but here was a man minus the nose, the entire upper and lower lip, and a part of the face extending on one side almost to the ear and on the other as far as the malar bone, the teeth showing ghastly and repulsive. I was informed that it was entirely out of the question for the man to come to Manila and have the ravages repaired.

On the steamer, returning, I also found a woman, Ambrosia Medraza, age twenty-one, on the way to Manila from the Batanes Islands to enter a hospital for treatment. Her nose was a mass of diseased tissue, and I knew that the entire organ would eventually be lost. She told me that there were a number of other similar cases in these sparsely populated islands. Having in a few hours seen two cases, I presume there may be a number of cases, as these isolated people until recently were almost entirely without any medical aid whatever. In her case the trouble commenced with a small sore on the side of the nose; this continued to spread, and as they lived away from any intelligent help, and ignorant as to what might be done for them, and too poor to do anything anyway, they have allowed the destruction to continue, and became alarmed only when it approached the angle of the eye. It was then that friends contributed toward making the journey. It had then been progressing for eight months. No doubt the loss might have been prevented by timely intervention. I learned subsequently that the case was diagnosed as lupus.

There is a vast opportunity for work and for investigation in these islands along the lines touched upon in this paper. While investigations of ethnological, anthropological, and other scientific character are constantly made by our own insular government, and by commissions and individuals sent here by scientific organizations, yet unfortunately there are no investigations made or provided for from a dental standpoint. This is a most regrettable circumstance, for the progress of civilization will in time obliterate many of the interesting and valuable data which might now be obtained.

TUBE TEETH AND PORCELAIN RODS: THEIR USES AND ADAPTATIONS IN PROSTHETIC DENTISTRY.

By JOHN GIRDWOOD, D.D.S.Univ.Pa., L.D.S.Edin., Edinburgh, Scotland.

(Continued from page 262.)

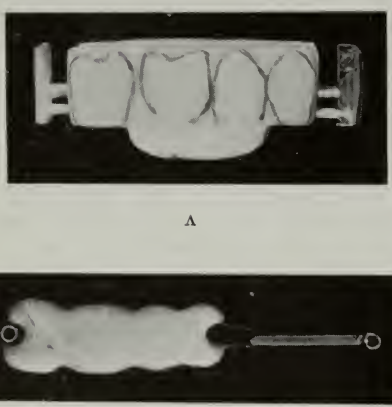
(XII.)

CHAPTER XVI. — Supplementary Suggestions—*Continued.*

The Addition of a Metal Lining to a Porcelain Tube.

In the first chapter dealing with the subject of tube teeth and porcelain rods,

Fig. 188.



A

B

A, Shows length of tube rod No. 27 with teeth outlined for bridge and showing tubed inlays joined to horizontal bars. B, End view, showing vertical groove for tubed inlays. (Fig. 193, A and B, shows finished bridge.)

it was pointed out that no advantage is obtained by the use of a platinum tube to tube teeth, and that the non-platinum tube tooth serves equally well, and has certain advantages over the older forms, which need not be detailed here. While the opinion which was expressed is adhered to, there are circumstances which sometimes call for a modification of it. Almost without exception, however, these are connected with the anchorage of a bridge, particularly a removable one where split posts are employed, and necessarily only in a case where tubed inlays cannot be used in the manner shown in Fig. 188, A, B. The tube in the molar crown should be enlarged by

Fig. 189.

A B C D

Method of lining porcelain tube. A, Single length of tubing. B, Washer soldered on. C, Tube and washer in place. D, Basal view.

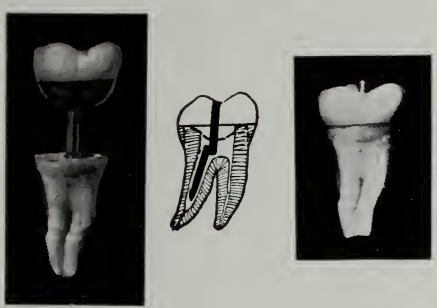
means of a diamond reamer to about No. 10 U. S. gage, the size being determined by the thickness of the split post which it has been decided will afford the necessary strength, and by the thickness of the metal tube. A good average for molars is about size No. 10 U. S. gage for tube, and size No. 11 U. S. gage for split posts. The following method will be found to yield satisfactory results: Cut off a length of thin tubing (Fig. 189), then form a washer or disk of gold from a piece of plate about 20 to 24 gage, and solder it to the base of the tube. Having formed a recess in the base of the porce-

lain into which the gold washer fits, the united tube and washer should be cemented to place; in carrying this out the tube may be left much longer than is necessary, in order to note that the tube is at right angles to the horizontal tubes and exactly parallel to the tube at the opposite end, or to such other form of attachment as may be used for a similar purpose.

Crown Work.

Fig. 190 shows a method of dealing with a case of extensive decay in a molar by means of a partial crown formed from

Fig. 190.



Photographs and sketch illustrating partial tube crown.

a tube tooth or section of a tube rod. Such cases are common, and the usual method of dealing with them is either to build them up with amalgam, by means of a large gold inlay, or to crown them. All of these methods are more or less unsightly, except the last, and the last only is free from this fault when an all-porcelain crown is used, while there may be objections to the employment of an entire crown. It is here that the partial tube crown frequently proves invaluable. The method of forming it is extremely simple, and is as follows: The pulp, if alive, should be devitalized, all decay removed, and the buccal canals filled. The apex of the palatal canal should be sealed after the canal has been reamed out to take a post of suitable size. An additional, though shorter post, may be used in one of the buccal canals. The approximal, buccal, and lingual walls of enamel should then be ground flat across. The posts should then be placed in the canals, and an impression and bite taken in the usual way, the posts being replaced in the impression before it is cast, if they have not come away in it. Before proceeding to fit the tube crown, the post should either be bent so that that portion of it which is to carry the porcelain crown is parallel to the long axis of the tooth, or a separate post should be soldered to the post entering the canal (Fig. 190). An alternative method is to cast an inlay to fit the enlarged pulp chamber, or to swage or burnish a piece of pure gold to fit it, and solder posts and inlay together. The porcelain partial crown should then be shaped up and fitted to the model, and when finished cemented to place.

The Treatment by Crowning of Upper Molars in Which the Palatal Root is Partially Exposed.

These cases are probably more commonly met with in the first than in the second molars, and the difficulties encountered in treating them successfully and of obtaining results commensurate with the amount of time and skill employed has received less attention than the importance of the subject appears to warrant. The method of dealing with those cases is almost invariably by means of an all-gold crown, and there are few cases in which an all-gold crown shows to less advantage. Besides, there is the difficulty of obtaining an accurate fit, and the liability to further recession of the gum. The latter inevitably follows sooner or later, and in consequence these cases are looked upon by the skilled crown worker as among the least successful of his efforts. By means of the tube tooth, however, highly satisfactory results may be readily obtained from the artistic, mechanical, and other points of view. Hitherto, no porcelain crown has been manufactured which will meet the needs of such cases on account of the fact that they lack a sufficient size of base to

cover the roots and extend and supply the lost tooth structure. Even the largest of the special forms of tube teeth or single-tube rods is sometimes too small in the base to permit of sufficient material for the purpose. A section, however, from one of the double-tube rods No. 26, 27, or 28 admirably meets the needs of such cases. Probably No. 28 will, on the whole, be found most useful. In preparing the roots, their surfaces should be ground level with or a little

Fig. 191.

Photograph and sketch showing double-tube crown formed from rod No. 28.

below the gum margin, as long and stout a post as the case will permit of should be fitted to the palatal canal, and a shorter one into one of the buccal canals. The pulp chamber may also be utilized for the purpose of adding to the available anchorage. The enamel should not be removed from the periphery of the roots, as the crown should ordinarily be a bandless one; the cap should be of gold either cast, swaged, or burnished to the surface of the root, and the posts which enter the canals are to be attached to it by soldering. In the case of a cast base, the union of the posts to the base had best be made additionally secure by soldering, unless the posts are of cast metal also, a method to be deprecated. After the base has been adjusted to the model, a section of tube rod should be roughfitted to the surface of the cap and to the form of the crown, and the posts adjusted and soldered in the manner already described. (Fig. 191.)

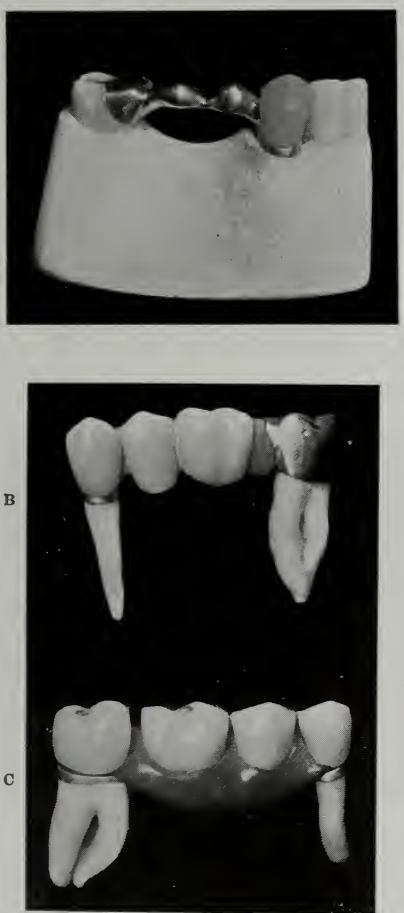
Bridge Work.

Hitherto attention has not been specially directed to the almost limitless use which may be made of the tube principle of attachment in connection with nearly every kind of prosthetic work. Examples have, of course, been given in connection with the tube rods, tube teeth, and gum sections, and more will be provided, but full justice cannot be done to the subject without unduly prolonging these papers, and so it must suffice for the present to point out that any of the cases so far dealt with can be duplicated in gold, either by the ordinary methods, by the casting process, in vulcanite, or any other material ordinarily used, and by following the usual methods of construction. (Fig. 192.)

There are also other points which deserve further attention. For example, the important part played by inlays in connection with tubes, posts, and bars has been abundantly illustrated, but attention has not been directed to the absolute rigidity which the combination of these affords. In the case of double tubes and posts it is so pronounced that any number of pieces may be so united with the result that they possess the rigidity of a solid piece and without the use of a cementing medium, although such a medium is necessary, as a rule, for uniting the pieces after they have been finally assembled. In the case of a single post or bar combined with an inlay, perfect rigidity depends upon the size and shape of the inlay, but it will be apparent that there is more need of a cementing medium to retain the parts together.

In Chapter X it was pointed out that it is not necessary to have the surface of individual roots or teeth exactly parallel to each other—a so-called necessity strongly insisted upon by most writers—but that by the use of tube teeth or rods

Fig. 192.



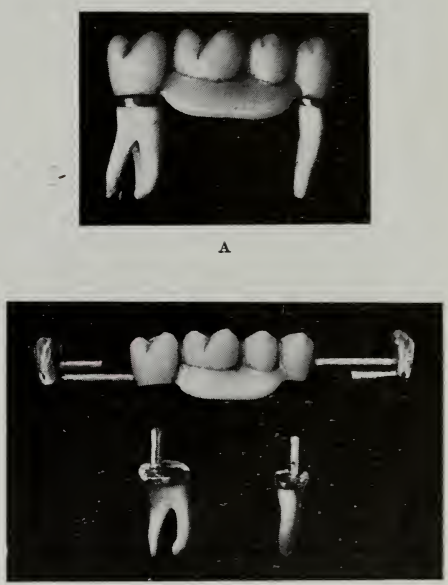
A, Cast gold bridge with tube tooth. B, With porcelain facings. C, Removable vulcanite bridge with tube teeth; anchorage by split posts.

the apparent difficulty may be readily overcome. Several examples were given in proof of this. There was one point, however, which was perhaps not made sufficiently clear, and with the object of remedying this it is necessary to point out that in connection with anchorages formed by tubes and posts, whether or not these are combined with inlays, the tubes or posts, if left sufficiently long to begin with, permit of accurate adjustment being judged by means of the eye alone, or by measuring the distance apart between the posts at their respective ends.

Description of Cases.

No attempt will be made to classify the various types of cases, but a few will

Fig. 193.

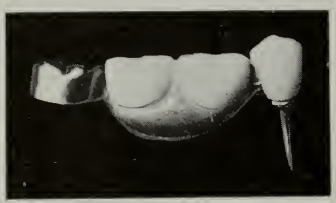


A, Removable bridge with cast tubed inlays. B, Shows details of construction.

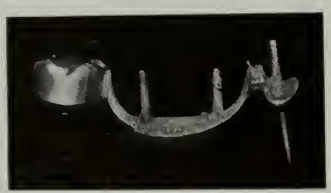
be given which it is hoped will be of sufficient importance to warrant attention being drawn to them. Fig. 193 shows a case where difficulties which might arise in connection with drilling additional tubes for the purpose of obtaining anchorage are done away with, and this is accomplished by cutting a groove in the posterior surface of the second molar extending from the base to the crown of the tooth, and intersecting or passing between the horizontal tubes. The groove,

or recess, thus formed need not, however, extend farther than one-third of the distance between the posterior surface of the crown toward its center. The anterior or bicuspid anchorage should be dealt with in like manner, as shown in Fig. 188, B. Into the groove thus formed,

FIG. 194.



A



B

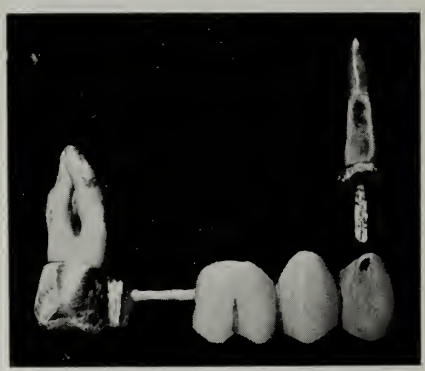
C

A, Lower bridge, right side, showing use of old-time gum section and single-tube tooth. B, Shows cast gold bar. C, Section through bridge and model showing relation of bar to alveolar ridge.

a length of tube should be placed, and the horizontal posts soldered to it, care being taken to have the tubes at right angles to the posts—and this, as already mentioned, is rendered easier by leaving the tubes fairly long to begin with. After they have been soldered to the posts, the tubes can be cut down to the required length. An inlay may now be cast on to the bars and post, as shown in Fig. 193, B, when the bridge may be proceeded with in the same way as if the tubes had been drilled through the porcelain for accommodation of the posts. The addition of inlays to the tube and bars may be dispensed with as far as the necessary amount of strength is concerned, but for other reasons their use is recommended.

FIG. 195.

A



B

A, Upper right bridge shaped up from rod No. 25. B, Shows details of anchorage.

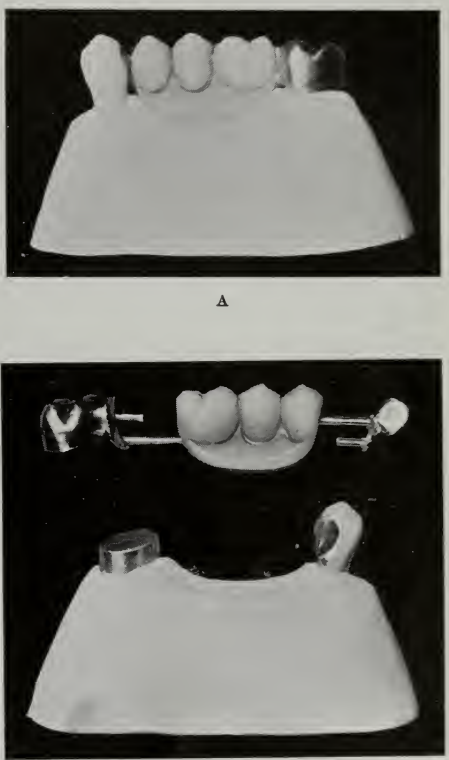
Fig 194 illustrates the use of an old-time gum tube section of two molar teeth, and serves to show how these sections could be utilized in some cases to take the place of fused porcelain, or sections formed from porcelain rods, with advantage in regard to time-saving and doubtless in other ways. The illustrations also show that the bridge is not a

saddle, but a bar, and that the bar is triangular in section with the apex in contact with the surface of the gum. (Fig. 194, c.) The purpose which this is meant to serve is to obtain a surface which can be readily reached by the tooth-brush throughout its whole length. The anterior anchorage, as will be seen, is by means of a capped second lower bicuspid, and a point to be noted in this connection is that provision is made for the employment of a tube tooth instead of a porcelain facing. By means of an extension of the bar on to the top of the bicuspid cap the impact of the bite is transferred to the long axis of the root, and not mainly on to the band. (Fig. 194, B.) This is accomplished without any material sacrifice of strength in the tube tooth, while in the event of fracture the crown can be replaced without the removal of the bridge.

Fig. 195 shows upper right bridge of four teeth, two bicuspids and two molars. The bicuspids and first molar are shaped up from the single-tube rod No. 25, while the second molar—an all-gold crown—has a horizontal bar soldered to its anterior approximal surface, extending as far as the post soldered to the bicuspid cap. The molar thus forms the posterior anchorage for the bridge, while the anterior end is anchored to the first bicuspid by means of a cap and band with the usual post attached, for which a tube has been drilled through the porcelain crown. In order to avoid the difficulties sometimes associated with drilling a special tube in the porcelain rod, the method shown in Fig. 188 may be adopted.

Fig. 196 is the case of a saddle bridge for the right side of the upper jaw, consisting of a porcelain block of three teeth, a molar and two bicuspids, shaped up from rod No. 27, and of an all-gold telescoping crown, which forms the posterior anchorage upon which a gold inlay is formed, carrying the horizontal bars which enter the tubes in the porcelain block. The anterior anchorage consists of a cast inlay and tube combined, the inlay being hollowed out for the purpose of accommodating an inlay and split post, to which the horizontal bars which enter the tubes in the porcelain blocks are attached. The apical end of the tube which forms part of the canine inlay is closed in order to prevent moisture from penetrating through to the interior of the root.

Fig. 196.



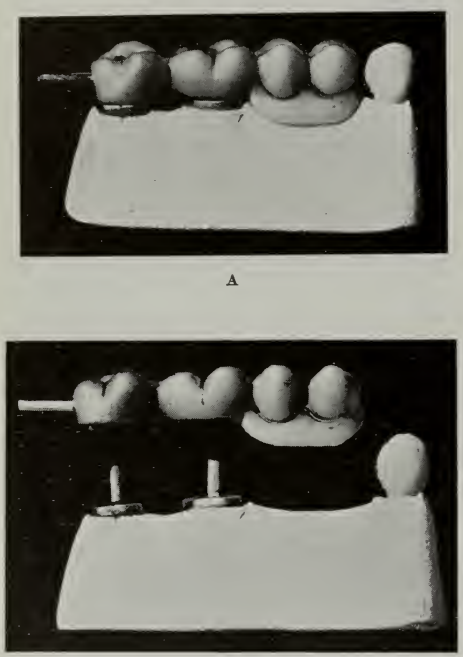
A, Upper right bridge from rod No. 27, showing posterior anchorage, gold telescoping crown; anterior anchorage by inlay and post into inlay and tube in canine. B. Lingual view and details of anchorage.

Fig. 197 is that of an all-porcelain extension bridge for the upper left side, formed from rod No. 27, supplying both bicuspids and the crown of the first and second molars. It will be observed that the absorption of the alveolus due to the loss of the bicuspid roots is made good by the porcelain saddle, which at the

same time affords a sufficient bearing for the anterior end of the bridge. If need be, additional support could be obtained by means of a spur resting on the canine, or by one of the anchorages which has already been described.

The posterior anchorage by means of the split post attached to the molar caps provides a secure and rigid attachment,

Fig. 197.

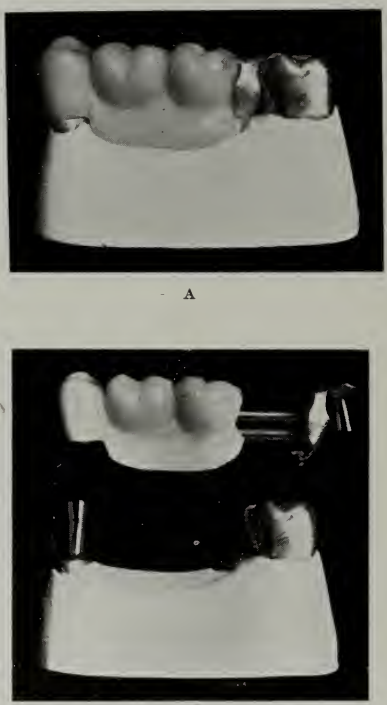


A, Upper extension removable bridge from rod No. 27. B, Shows anchorage by means of split posts.

with at the same time provision for easy removal, and if occasion arises, for readily tightening the piece by slightly opening the split posts. Here the addition of the metal tubes lining the porcelain tubes in the molar crowns may be adopted with advantage. It will be observed that the rod has been used with its broadest section toward the gum, in order to obtain the maximum area of saddle. Had a greater length of tooth or depth of saddle been required, rod No. 39 would have been substituted.

Fig. 198 shows a removable saddle bridge for the left upper jaw, consisting of four teeth, second bicuspid and three molars. The porcelain part of the bridge includes the bicuspid and the two molars, while the third molar is an all-gold

Fig. 198.



A, Lingual view of upper left removable bridge from rod No. 27. B, Shows posterior anchorage by means of inlay and split post, anterior anchorage by means of split post.

crown forming the anchorage for the posterior end of the bridge, the anterior end being anchored on to the root of the second bicuspid.

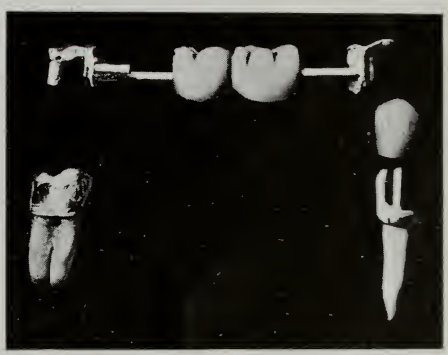
In order to provide for the absorption of the alveolus and shrinkage of the gum, and at the same time to provide additional support for the bridge, the porcelain is shaped to fit the alveolar border. The anchorage for the anterior end of

the bridge is obtained by capping and banding the bicuspid root, and employing a split post which passes through the porcelain block, the tube of which has a metal lining. The all-gold crown which supplies the anchorage for the posterior end of the bridge has a recess formed in it extending from the center of the crown toward its anterior approximal surface, down which it is prolonged to a point a little short of the gum margin. Into the bottom of the recess in the gold crown is soldered a short section of tube to take a No. 13 U. S. gage split post, and the tube carried to the base of the pulp chamber. An inlay formed to fit the recess in the crown has cast or soldered into it the split post which enters the tube. A separate inlay joining the horizontal posts which extend through the porcelain is then soldered to the inlay spur with split post attached, which has been already described. A perfectly secure and strong anchorage is thus obtained, and one which not only permits of easy removal and replacement of the bridge, but if need arise it can readily be tightened at any time by slightly opening the split posts.

Fig. 199 is a removable bridge for the right side of the lower jaw, and consists of the three molars and second bicuspid, the latter and the third molar constituting the abutments. The component parts of the bridge are as follows: The body, consisting of the first and second molars shaped up from the double-tubed rod No. 26 with the parallel tubes horizontal; a tube tooth mounted on the bicuspid root, and an all-gold crown on the third molar. The details of the attachment are as follows: The all-gold crown is constructed in the same manner as described in the previous case (Fig. 198) with inlay and split post; the anterior anchorage is obtained by means of a tube tooth mounted on the capped root in the usual way, but having a groove in its posterior approximal surface extending from the base to the crown and prolonged two-thirds of the way across its surface, for the purpose of lodging and supporting a gold inlay to which a vertical split post, as well as two horizontal bars which enter the porcelain molars, are also attached. In addition to the vertical post carrying the single-tube crown, there is also soldered to the cap of the bicuspid root a tube about three-quarters section, with the opening presenting toward the molar, the tube having an inside diameter to take a No.

Fig. 199.

A



B

A, Removable bridge for right side of lower jaw from rod No. 26. B, Shows details of construction and anchorage.

13 U. S. gage split post attached to the inlay.

Fig. 200 illustrates a type of removable bridge belonging to the class known as "interrupted" bridges, this description being generally applied to those cases in which one or more natural teeth which are not necessary for use as abutments intervene in such a way that they cause an interruption or break in the continuity of the parts of the bridge. It will

be seen that in the case under consideration the bicuspids and first molar are missing, and that the crowns of the central incisors as well as that of the upper right molar require replacing. The following description will doubtless serve to convey a sufficiently clear idea of the procedure followed: The porcelain parts of

Fig. 200.

A

B

A, Removable "interrupted" bridge. B, Shows details.

the bridge consist of the two bicuspids and the first molar shaped up from the double-tube rod No. 27, to fit the alveolar border and the bite, while the two central incisors are shaped up from tube rod No. 30. These are united by means of a narrow gold plate extending on to and covering the capped central incisor roots. An inlay formed in the anterior approximal surface of the bicuspid to which the horizontal bars are attached is soldered to the gold plate. The illustration shows that the roots are capped and banded and have split posts soldered to them as for an ordinary tube crown, and that the anterior anchorage of the bridge is secured by means of tube posts soldered to the plate through which pass the split posts attached to the caps of the central incisors, the tube in the tube

Fig. 201.

A

B

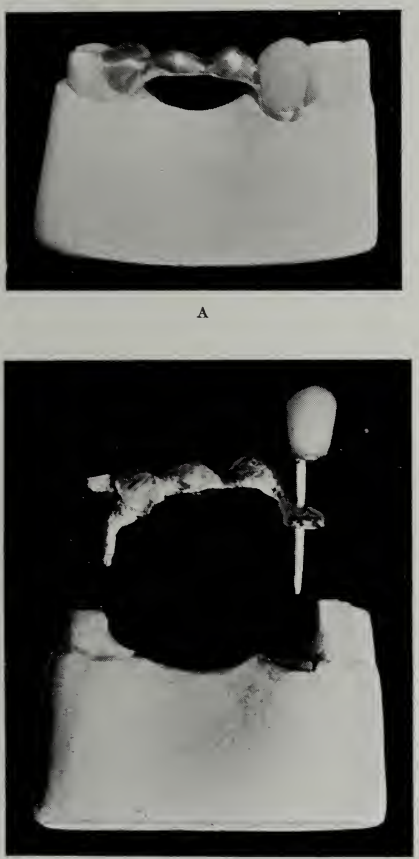
A, Removable bridge for right lower jaw, anchorage by means of split posts. B, Shows anchorage.

porcelain crowns being enlarged for the purpose. The upper right molar forming the posterior attachment is provided with an all-gold crown which has a recess formed in it for the accommodation of an occlusal rest which forms part of the clasp attached to the inlay and horizontal bars.

Fig. 201 shows another example of a removable bridge for the right side of the lower jaw. The anchorages consist of split posts size No. 11 U. S. gage soldered to the capped roots of the sec-

ond bicuspid and second molars; the bridge being shaped up from tube rod No. 26, and shaped to fit the alveolus in the interspace between the molar and bicuspid, and bicuspid and canine, thereby increasing the stability of the piece.

FIG. 202.



A

B

A, Gold bridge and tube tooth with self-cleansing space. B, Shows details.

Fig. 202 shows a small gold bridge with large self-cleansing space, for the right lower jaw, consisting of two bicuspids and a crown. The posterior anchorage is obtained by means of a large gold inlay anchored into the pulp chamber and anterior root of the first molar, and the anterior anchorage by capping and banding the canine root with post attached in the usual way for the purpose of carrying a tube crown. The union of the gold cusps to the canine cap is carried out in the manner shown in the illustration, without interfering materially with the strength of the tube tooth.

THE USE OF GUM TUBE SECTIONS IN BRIDGE WORK.

In the event of a revival in the manufacture of gum tube sections—which it is sincerely to be hoped will take place—a valuable addition would be made to the materials available for the purpose of forming saddle bridges which would be not only stronger than fused porcelain, but would also save much valuable time in building up and fusing. Moreover, these sections could also be modified by the addition of fused porcelain to meet the necessities of individual cases.

TUBE RODS AS A FOUNDATION FOR FUSED PORCELAIN BRIDGE WORK.

In the chapter on Bridge Work it was pointed out that fused porcelain has proved a disappointing material in connection with bridge work except in the hands of the most highly skilled workers. The reasons advanced in proof of this rest mainly on the lack of strength in the material, necessitating a platinum framework strong enough in itself to permit of the strength of the fused porcelain being in most cases disregarded. Manufactured porcelain, on the other hand, is of sufficient strength, unless in cases of close bite, to allow of its use without the necessity for employing a metal framework, although in point of fact tube rods furnish the means of combining a framework and anchorage at the same time, and possess the advantages previously spoken of. There seems every reason, therefore, why tube rods should prove of great use in connection with fused porcelain work, furnishing as they do the necessary strength of porcelain body combined with a ready and efficient means of reinforcement by horizontal and other bars, which, as already

described and illustrated, can be used for the purpose of assisting to furnish any of the methods of anchorage hitherto relied upon, and many others to which tube rods are specially suited.

The details in connection with the formation of a bridge in the manner spoken of need not to be entered into, but it is suggested that the section of porcelain rod should be roughly shaped up to the desired form, both with regard to the body of the piece and outline of the teeth, and that the required additions be made by means of suitable porcelain body.

Partial Plates with Teeth Formed from Porcelain Rods.

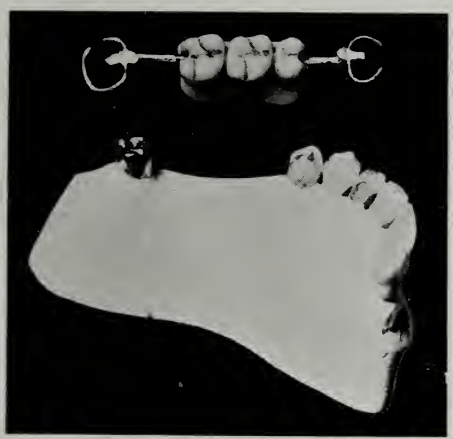
Probably the shaping up and fitting of a partial plate with tube teeth from a porcelain rod will appear to most men to be a somewhat formidable undertaking. In reality it is much simpler than it looks. This statement may be doubted, if not even disbelieved. Nevertheless, it is in accordance with the facts of practical experience, and the reader is advised before coming to what may prove a hasty conclusion, to put the matter to the test. By doing so he will doubtless be able to confirm the foregoing statement. At any rate, an opportunity will thereby be afforded of obtaining an approximate estimate of his manipulative and artistic ability. The problem is much simpler than it doubtless appears; the only point in which it differs from that of an all-porcelain saddle bridge is in the absence of the vertical anchorage posts which form guides for securing the porcelain block's being returned to its exact place on the model while the base is being fitted to it. In the case of a bridge this is provided for in several ways, as has been shown by various examples illustrated and described in these papers. Fortunately, the means of supplying the necessary guides is a simple matter, and the description given on page 387 and shown in Fig. 193 forms a suitable example of the first steps necessary for providing vertical tubes for the accommodation of posts for the purpose. In order to make the matter quite clear, a short description of the procedure followed in shaping up a porcelain plate is here given:

A section of the porcelain rod, usually No. 26, 27, 28, 29, or 39, is cut off, sufficient to fill the space between the abutments. This is then roughly shaped up to the contour of the gum, and the teeth also outlined. A horizontal slot is next made at each end of the block, as in Fig. 188. Into the slot or recess so formed, a vertical tube with horizontal anchorage bars attached to it is temporarily fixed at or in either end of the block, which is thereby transformed into a porcelain block with vertical tubes in addition to the horizontal ones, and is in fact similar for all practical purposes to a porcelain rod which has had tubes drilled through it for the purpose of accommodating the posts and caps of a crowned root or roots, and is in consequence ready to be dealt with in the same way as a porcelain saddle bridge—with this exception, however, that the vertical posts are not yet provided. This is accomplished thus: The roughly shaped block is either held in position with the fingers, or is temporarily secured by means of sticky-wax in a similar manner to that described in determining the position for the post for a tube tooth on a metal plate. The position of the posts having been ascertained by means of a marker, holes should be drilled through the plaster model for the posts with the least possible mutilation of the surface of the model, and these holes should be enlarged from the under side of the model. The vertical posts are then passed through the tubes, care being observed that they are parallel to one another, and the posts, which may be of the base metals, iron, German silver, or brass, are roughened or bent in order that they may be securely held by plaster or other medium. Thus secure guides are provided whereby the block or rod may be fitted by grinding its under surface to adapt it accurately to the surface of the model in the same way as a tube tooth is fitted to a plate, or the end or ends of a bridge to caps on roots. But where a large surface such as a plate is

to be ground to fit, it is sometimes advisable to do the fitting on a separate model, and retain the original one either for final fine-fitting or for reference, and a duplicate model for this purpose, or in point of fact any number of duplicates, can be quickly and easily formed in the following manner:

FIG. 203.

A



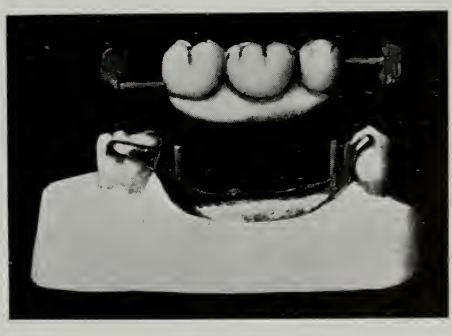
B

A, Upper right partial porcelain plate. B, Shows details of construction.

Over the posts on the original model are placed sections of metal tubes which fit the posts easily but accurately, the tubes being roughened or having tags soldered to them to engage or secure them in the impression of the model, which should now be taken, in one of the many well-known ways whereby models are duplicated. The impression having been taken, posts to fit the tubes are now inserted into them, the projecting ends being left sufficiently long and being at the same time bent or roughened in order to hold them securely. The impression is then cast in the usual way, and when parted the model gives an exact duplicate of the original. Instead of casting the impression in plaster, it may be cast in fusible metal or partly in metal and partly in plaster. If altogether in plaster, the model may be dried and hardened in any of the usual ways. The subsequent steps are, as already mentioned, to grind the base with suitable wheels until it fits the model accurately all over. This is generally facilitated by the use of paint in order to mark the points of contact, but it does not require much experience in order to be able to dispense with the use of paint until near the stage of fine-fitting.

FIG. 204.

A



B

A, Lower right partial plate. B, Shows details of construction.

The shaping up of the teeth with regard to their form and contour, and to the bite, is carried out on the lines already laid down. After this has been accomplished, the piece should be smoothed and polished (see chapter on Polishing Porcelain Teeth), when it is ready for the bands, or such form of anchorage as may be decided upon. The case is now ready for the mouth, after the bands with their anchorage posts have been cemented to place by sulfur or other suitable medium. (Fig. 203.)

The slots or recesses for the accommodation of the vertical tubes are no disadvantage, as they are simply a continuation of the crowns of the teeth at either end of the inlays which would be formed in them for the purpose of joining the bars and bands together, but if it should be considered advisable not to prolong the gold to the crowns of those teeth, this may be done by having the temporary vertical tubes with their attached horizontal bars outside the ends of the porcelain block. This would necessitate cutting away part (perhaps half) of the tooth from either end of the model for the purpose of securing a position for the guiding posts. This, however, would not matter, as the permanent model would remain for the purpose of forming the bands and of adjusting them.

It is needless to enumerate at length the advantages to be derived from an all-porcelain plate, as they are obvious, at all events from the points of view of cleanliness and of the scope such work provides for artistic treatment. The question of the amount of time required will naturally occur to some men, and the comparison this would bear to, say, the time required for making a partial gold plate. Even with a limited amount of practice and with average skill, the time taken should compare favorably with that of a partial gold plate of similar size, and may be put down at from forty-five to ninety minutes for each tooth on the porcelain plate. This does not include the time spent in making the bands and soldering the horizontal posts in them, but for the porcelain plate and teeth alone. These, however, would not occupy much time, and it is to be remembered that there is no slow heating-up and cooling-down of plate and teeth for soldering, and no slow heating-up of investment as when a cast plate is used, neither is there time spent in taking dies and counter-dies for striking up a gold plate.

Fig. 204 shows a partial lower cast plate with gum section of three teeth shaped up from rod No. 27 and with tubed inlays as described on page 387.

SIMPLIFIED SURGICAL TECHNIQUE EMPLOYED IN ROOT RESECTIONS FOR THE RADICAL CURE OF CHRONIC DENTO-ALVEOLAR ABSCESS:

Illustrated Stereoptically, Before and After Operating.

By F. K. REAM, M.D., D.D.S., New York, N. Y.

(Read before the Northeastern Dental Association, at its annual meeting, Boston, Mass., October 15, 1914.)

NO department of oral surgery presents a greater opportunity to the practicing dentist for the arrest of systemic disease and the restoration of health than root resection, amputation, apico-ectomy, or alveolotomy, for the radical cure of chronic dento-alveolar abscess.

HISTORY.

Richard H. Riethmüller, Ph.D., D.D.S., furnishes the following historical sketch concerning root resection:

While the replantation of teeth was one of the early achievements of dentistry before it had attained the dignity of a profession, the practice of root resection is of comparatively recent date.

Smith reports in 1889 that eighteen years before—that is, in 1871—he performed the resection of a root in a case of facial neuralgia. The pain never returned, and the writer subsequently repeated the operation in cases of facial neuralgia.

Farrar in 1880 performed surgical root treatments in chronic alveolar abscess; also Dunn in 1884. (See *British Journal of Dental Science*, vol. xxvii, No. 38.)

Grayston in 1887 (*Journal of the British Dental Association*, January 1887) pronounced anterior teeth, bicuspids, and even molars as being suitable for surgical treatment in cases of chronic alveolar abscess.

In the same year, Claude Martin reported in the Transactions of the International Medical Congress of 1887 that in 1881, in a communication addressed to the Congress of Algiers, he proposed "a new method of treatment of chronic periosteitis of the dental alveolus, consisting in the actual section, *in situ*, of the diseased radicular extremity by the aid of a crown trepan."

M. L. Rhein in 1890 (see *Dental Review* 1890, No. 10) recommended "amputation of tooth-roots" in chronic alveolar abscess, and in roots which had become necrotic from pyorrhea alveolaris. He performed this operation also in molars.

White, in 1893, gave a report before the International Dental Congress held in Chicago concerning the treatment of chronic abscesses. He amputated the root apex, and in molars the entire diseased root. Hern and Woodhouse in 1893 (*Korrespondenz-Blatt für Zahnärzte* 1893, p. 355) described the amputation of the apical root portion of incisors affected with chronic alveolar abscess.

Up to that time, the surgical treatment of roots was practiced only in America, but this method was not based upon scientific reasons or methods until Prof. Dr. C. Partsch, in 1896, in the "Third Report of the Polyclinic for Dental and Oral Diseases of the Dental Institute of the Royal University of Breslau," for the first time established the scientific indications and the surgical technique of root resection.

In Austria, Dr. Rudolf Weiser, in 1900 (Proceedings of the Third International Dental Congress of Paris) advocated and enlarged upon Partsch's method, and since then the chief advocates of this method, which has become routine practice in Germany, have been Kunert, Luniatschek, Mayrhofer, Guido Fischer, Metz, Konrad Cohn, Euler, and Williger.

ROOT RESECTION AS A PREVENTIVE MEASURE.

Dr. Charles H. Mayo sagely remarked that the next step in preventive medicine must be taken by the dental profession, and it is up to us as dental surgeons to make good.

Dr. Victor C. Vaughan, president of the American Medical Association, says—"Whatever the business outlook in commercial matters may be, there has never been a time in the history of the world when the dentist and the physician had so much to do, nor has there been a time when this work was of so much import to mankind. Preventive medicine, a large part of which is dentistry, is proving to be a most potent factor in the uplift and betterment of mankind. The public recognizes this function, and it is not only willing to accept aid from the physicians and dentists, but is demanding help. Dentistry and medicine can grow and increase in helpfulness to mankind only as scientific investigation develops and advances."

Considering the frequency of this malady, as daily witnessed by the practicing dentist, it behooves him to be up and doing, and to master a simplified technique which I hope to outline in this paper. Since the advent of roentgenology, there is no excuse for the operator working in the dark. Foremost in the rank of practice-building stands this opportunity, like a beacon light for every practicing dentist of ordinary skill to develop a broader dentistry.

The saving of time, if nothing more, in the treatment of abscessed and multi-rooted teeth is sufficient incentive for surgical interference, to say nothing of the expenditure of useless hours and energy in repeated treatments, which

lead to failure or extraction in the end, while surgical interference could have brought about an immediate cure.

broader knowledge in the etiology of systemic conditions marks a new era in dentistry.

Fig. 1.

Fig. 2.

Fig. 1 shows a pericemental abscess extending between the roots of two central incisors and well up to the apex of the tooth, but does not involve the apical end.

Fig. 2 shows an alveolar abscess and necrotic area in contradistinction to Fig. 1.

The differential diagnosis is made very clear in these prints made from practical negatives in my routine practice. Note the metal filling in the lingual of the right central incisor made by the dentist, who should have made an X-ray of the case before puncturing the pulp of a normal and vital tooth.

Fig. 3.

Fig. 4.

Figs. 3 and 4 show typical alveolar abscess, the primary source being the lateral incisor. The invasion extended to the central, causing death of the pulp. Both teeth were saved by surgical interference.

Some of these cases gave a history of rheumatic conditions, heart lesions, joint diseases, and general systemic infections, which wonderfully improved almost immediately after pus pockets were drained.

RECOGNITION OF THE SYSTEMIC DANGERS OF DENTO-ALVEOLAR ABSCESS.

The "Macedonian cry" of the medical profession for the assistance of the dentist to combat disease and thus gain a

No physician today dares discharge his patient in a case of confused diagnosis without eliminating the oral cavity as a causative factor in systemic disease.

Gilmer says that 25 per cent. of devi-

talized teeth are affected with alveolar abscess.

The dentist should become cognizant of the general condition of his patients as to systemic tone, and should call at-

the oral surgeon and specialist in extraction, is appalling. In my opinion any dentist who gives up the fight to save teeth in a majority of cases, without a radiogram and the careful study

Fig. 5.

Fig. 6.

Figs. 5 and 6 show typical cases before and after operating for alveolar abscess. The amount of tissue removed in Fig. 6 was determined by the sense of touch and the appearance of the granulation tissue, it being the aim to reach sound surrounding tissue.

Fig. 7.

Fig. 8.

Fig. 7 shows necrotic apical root-ends, imperfectly filled, before resection for the radical cure of chronic dento-alveolar abscess.

Fig. 8 shows the same condition after operating.

These prints are valuable to the dentist, showing clearly the necessity for an X-ray before undertaking these operations. Note that the root-ends are widely separated; separate incisions were made over each root in this case. Without the X-ray the operator might be greatly misled as to the exact location of the field for operation.

tention to foci of infection, and thus the physician and dentist should work together in the cure of disease.

The useless and ruthless extraction of abscessed teeth—which are savable by surgical interference—as witnessed by

of canal and root formations, is derelict in his duty toward the welfare of his patients.

It is true that nothing will more insidiously break down the defensive forces of the body than alveolar abscess,

oftentimes unsuspected by the dentist, and until the last few years seldom if ever observed by the medical practitioner. Chronic endocarditis and myocarditis may be due to streptococcus viridans supplied by the infected blood stream. A vegetative growth on the valves and endocardium takes place; swimming in this oxygen stream it multiplies, and fortifies itself against all methods of treatment. Acute rheumatic fever, arthritis deformans, anemia, neuralgia, cystitis, chronic appendicitis, chorea, cholecystitis, and sinusitis may arise from alveolar or peritonsillar abscesses.

Rosenow and others have transmuted pneumococcus and streptococcus infections from tissues and exudates in these diseases. The blood stream carries infections from the focal point, depositing them in remote parts of the body. Streptococcus viridans, a virulent type of infection found in the blind abscess, corresponds with joint infections.

The practice of treating chronic dento-alveolar abscesses lightly, so prevalent in the dental profession, is entirely too neglectful, and it is the essayist's desire, in a measure, to overcome this practice.

To the present time my operations for the radical cure of these lesions have been largely confined to upper bicuspids and the six upper and lower anterior teeth, although I have frequently completely extirpated anterior or posterior roots of upper and lower molars, also lingual roots of upper molars.

FIG. 9.

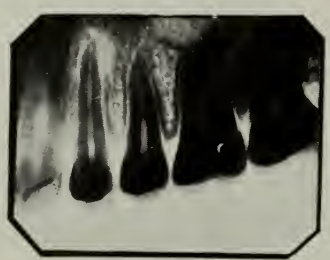


FIG. 10.

FIGS. 9 AND 10—X-rays before and after operating. *Case history:* Female, age thirty-eight, unmarried. General health good except for enlarged joints on each hand. History of constitutional diseases negative. Laboratory tests showed blood and urine normal. X-ray examination of all the teeth, for alveolar abscess or other abnormal conditions, negative, except upper right first bicuspid with blind abscess. Tooth not sore and showed no indications of trouble to percussion or thermal tests. The tooth was single-rooted; the root-canal had previously been treated (?) and a filling inserted. *Treatment:* Operation for root-resection, and culture sent to laboratory. Test showed *streptococcus viridans* so commonly found in joint diseases. Autogenous vaccine; patient immediately improved. Antero-posterior X-ray of head showed maxillary, sphenoid, ethmoid, and frontal sinuses normal.

One peculiar condition about many of the cases that come under the observation of the roentgenologist is that the patients do not complain of pain in the teeth while at the same time they are suffering from systemic infection.

INDICATIONS FOR SURGICAL INTERFERENCE. CLASSIFICATION.

While it may be possible to accomplish much good without the roentgenogram, such purely guesswork practice resembles too much a ship at sea without a rudder. The operator may be greatly misled in his judgment as to the necrosed area, diverging or crooked roots, etc.

Some of the most frequent indications for root resection are (1) imperfect root-canal fillings; (2) perforations through crooked roots; (3) traumatic injuries and fractures; (4) broken

broach ends, and (5) excess of guttapercha or other root-canal filling protruding through the apical foramen. In short, any pathologic condition that involves the apical region in teeth which show sufficient rigidity to withstand surgical treatment is operable.

TECHNIQUE.

After deciding upon operative interference, and finding confirmed by the X-ray the perfect filling of the roots, nerve-blocking (after Riethmüller) with novocain and suprarenin, should be resorted to as the method of choice, under the strictest aseptic precautions. General anesthesia, with but few exceptions, has no place in this work.

INSTRUMENTATION.

But few instruments are required. Those needed are the following: One small obtuse bistoury (Black), four dental burs, a simple retractor made from piano wire, a small curet, and a syringe.

A straight incision in the long axis of the tooth-root, from about 4 to 6 mm. in length, is made. The same small bistoury—I use Black's knives—may be used to release the tissues from their periosteal attachment. A small, spring-point retractor made of piano wire is placed in this opening, and the tissues are drawn taut. Small pointed tissue-scissors are used to clip the resisting fibers of tissue until the opening is of about the size of the diameter of an ordinary lead pencil. The wound should now be irrigated with physiological saline solution, and if annoying hemorrhage occurs, a tampon saturated with adrenalin chlorid applied under pressure for a few moments will control the bleeding. The alveolar plate is now removed with an ordinary rose-head bur, and the root-end is definitely located. The bur is made to completely encircle the apical end, and the opening is extended down the neck of the tooth to sound support or bony tissue.

The end of the root is then plainly visible, and may be excised with a small rose-head or fissure bur. A larger bur or curet is now used to remove any remaining soft or necrotic bone, and the wound is irrigated and packed lightly with a narrow sterile gauze strip dipped in sterile vaselin. Vaselin prevents the breaking-up of granulations and retarded healing. This dressing should remain for from twenty-four to forty-eight hours, according to the subsequent suppurative process.

The dressing is renewed in forty-eight hours, and the wound lightly irrigated. About three dressings applied at such intervals will suffice.

As soon as these little wounds show signs of granulation, they are filled with bismuth paste, and the patient is dismissed.

The accompanying illustrations show several inoperable cases, and operable ones before and after operating, the affixed legends indicating the history, the operative technique, and the after-treatment employed.

DANGER AND ACCIDENTS TO BE AVOIDED.

After opening the alveolar plate and definitely locating the root-end, extreme care should be exercised to avoid injury to adjacent teeth. This possibility will be determined by a radiograph, which will show the proximity of adjoining teeth.

The operator will usually make the opening too high up. It is better even to make the opening a little low and gradually extend the operation to the apex, than to start too high. I have observed some operators make this error of getting too high up on the neck of the tooth-root, or beyond the apex, and during the curetting or burring away of the necrotic tissue, perforate the floor of the nasal cavity. The root-end must be exposed to view perfectly, and adrenalin chlorid employed to obtain a dry and clear field of operation.

Occasionally I have discovered an amputated root-apex which had been left in the wound by an operator who had not taken an X-ray after performing the operation. Healing cannot take place under this condition, and suppuration will invariably follow.

It is absolutely necessary for the operator to search well the area and pocket, after operating, for dislodged fragments. This is usually accomplished by means of a spoon curet. Retarded healing is usually due to such fragments left in the wound, and occasionally in suppurative conditions it may be necessary to reopen these wounds and repack until granulation takes place.

IMPRESSION TAKING BY THE GREEN METHOD.

By D. D. ATKINSON, D.D.S., Brunswick, Ga.

(Read before the union meeting of the Georgia State Dental Society and the Southern Branch of the National Dental Association, Atlanta, Ga., June 4, 1914.)

IT might seem strange that, after all that has been written upon this subject, one should venture to come before representatives of the dental profession with anything claimed to be new upon this subject. It is well known that many of the leading dentists of the country have passed that period when the construction of artificial dentures was attractive to them, and have set aside that important branch of prosthetic dentistry. To these I would say that whatever be their attainments in scientific bridge work, gold or porcelain inlays, or whatever the character of their operations, they do not exceed in scientific requirements those of modern advanced plate work construction, as to both the taking of impressions and the anatomical arrangement of the teeth themselves. To him who is so unfortunate as to have to wear a denture, there is nothing so important as that he should have the best that skill can produce; therefore the dentist who has served his patients up to the time when they are in need of artificial teeth should then feel a just pride in giving them the best possible substitute.

The writer does not claim any authentication for the ideas to be set forth in this paper, but wishes solely to call the attention of the profession to a system of impression taking promulgated as the "Green Brothers' Course in Plate Work."

To those who are not familiar with this system I would say that these operators have given to the profession a system of impression taking that is entirely new, and has never been taught in the dental colleges to any extent; and while the subject is entirely too large to be presented in full in a paper of this kind, I shall endeavor to call attention to a few features, with the hope that my colleagues may be inspired to search further into the possibilities of this system by reading the book written by its originators, which is to my mind the most practical and sensible treatise on this subject that has yet been offered to the profession.

AIM AND ACCESSORIES OF THE GREEN METHOD.

In the edentulous upper jaw of a living subject there is a zone of soft immovable tissue which extends from the frenum labii all the way around behind the tuberosities and across the palate. This zone reaches the line between the hard tissues of the hard palate and the soft movable tissues above and behind. It is at this zone that it is intended, under this new system, that the rim of the plate shall terminate, and rest with valve-like pressure upon the soft immovable tissues, for, if it falls short of reaching this part, the rim of the plate will rest upon the hard tissues

of the alveolar process, where it will be impossible to obtain the valve-like pressure. And if it extends beyond this zone, the movable muscles and tissues will be continually throwing the plate from its position. This theory holds good both in the upper and lower jaws. To accomplish this result, the Green brothers have employed the specific kind of modeling compound known as Kerr Perfection, and have devised impression trays especially for that purpose. These impression trays are made much shallower than the rim of the plate is meant to be, and shorter than is intended for the length of the plate to be.

TAKING THE IMPRESSION FOR A FULL UPPER DENTURE.

For a practical case, a tray is selected which just about fits the jaw, with perhaps an eighth of an inch to spare all around. The tray and impression material being ready for taking a full impression, sufficient of the material is softened in warm water and then placed in the tray and finger-fashioned to conform somewhat to the shape of the jaw. Just before inserting it into the mouth, it is held over a spirit lamp, and the entire surface is softened to a semifluid state, but not hot enough to burn; then it is carried into the mouth, and with a gentle wave-like motion pressed up with about the pressure which the plate is to exert after it is made. The surplus material above the rim all around is pressed up against the outer edges of the alveolar process first on one side and then on the other, and with the index finger around and behind the tuberosities.

MUSCLE TRIMMING.

While the material is still soft, the patient is instructed to work the muscles of the face and of mastication in such a way that they shall cut their own way into the material, and in this way form the height of the impression and likewise of the future plate—but not the *exact* height. This is called muscle trimming. With a cold wet cloth held on the underside of the tray, the modeling compound is soon chilled and removed from the mouth, when it is immediately immersed in cold water. All surplus compound is then cut away, leaving the top of the rim as indicated by the trimming of the muscles, and this trimming is done so that the rim of the impression is not much thicker than the finished plate, whereupon the posterior portion of the impression is cut off to the length of the plate.

DETERMINING THE LENGTH OF THE PLATE.

To find the length of the plate, it will be seen that the movable muscles of the palate have turned the impression down, for it must be borne in mind that the plate must extend posteriorly into the aforesaid zone which intervenes between the hard tissue of the hard palate and the movable tissues of the soft palate. The edges of the rim are then softened, one side at a time, over a little spirit lamp, and placed back in the mouth, with instructions that the patient shall still muscle-trim them, until no further impression can be made by moving the muscles. This, then, is the exact height which the finished plate must have.

If there is any doubt about the length of the plate, this can be determined by warming the posterior edge and directing the patient to swallow. If the plate should be too long, it will be indicated by impression of the movable muscles of the palate, and should be trimmed accordingly. We shall now assume that the muscle trimming has been done on both sides, the next step being to conform the impression all around to the zone of immovable soft tissue already mentioned. This is done by warming the edge of the impression over the hand spirit lamp slightly, just enough to enable it to yield to pressure all the way around behind the tuberosities. This may be done one side at a time, the impression to be carried quickly to the mouth and the rims to be conformed to the soft zone by the

pressure of the fingers and to be held there until the material becomes hard. When this is done properly, there will be a valve-like pressure all around on the outside of the alveolar border, which will not leak, and which will not be thrown down by the muscles of the face, because they have already cut their way into the material when it was soft.

Post-damming. The next step consists in post-damming, which means that the impression at the palate must be warmed and pressed up to conform to the palate itself; this being accomplished, if the work has been properly done the impression will hold fast in the mouth and is called a test impression, and just as this impression fits, so will the plate. I have seen patients try to shake such impressions out of their mouths, or to cough or spit them out, and fail on account of the excellence of the suction.

COMPARISON BETWEEN OLD-TYPE TRAYS AND GREEN TRAYS.

The same principles, with a modification in the details, are to be observed in taking lower impressions. A comparison between the impression trays of the old type and the trays used in the Green system shows that the old-type trays with high rims and long handle will, of necessity, strain all of the muscles of the lips and cheeks out of position, and hold them there while the material is hardening, be it plaster or compound; consequently, when these muscles rebound, there can be but one result; viz, the upper plate must drop or the lower plate jump up. Muscle trimming cannot be done with such trays.

In comparing two impressions, one taken by the old method with the deep tray, the other by the Green muscle-trimming method in the Green tray, the difference is very apparent. The one taken with the old tray cannot be replaced in the mouth with any expectation that it will remain *in situ* without being held, even should it have been taken in plaster. The other impression can be tested in the mouth, and will remain *in situ* comfortably while the patient discusses the whole process with the operator without once throwing it loose.

CONCLUSION.

The results obtained from the Green method are so satisfactory in shallow and all other kinds of mouths that I would prophesy that in time to come no other system of impression taking will be taught.

I should like to state in this connection that I have no interest whatever in the sale of the work called "The Green Brothers' Course in Plate Work," but on account of the impossibility to give more than a scant outline of the great possibilities of this system, I would advise every plate-worker to study this book diligently.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

DEEP MUSCULAR INJECTIONS OF SUCCINIMID OF MERCURY IN PYORRHEA ALVEOLARIS.

By PAUL GARDINER WHITE, D.M.D.,
ACT. ASST. DENTAL SURGEON, U.S.N.

TO be able to check the ravages and afford relief to the sufferer of that most distressing and destructive disease, pyorrhea alveolaris, was in the past indeed a worthy endeavor on the part of the operator who had the patience and persistence and the patient who had the courage and the faith. To be able to cure a majority of cases with the least possible discomfort and pain, and in an incredibly short time, while no more worthy of the operator than in the days of old, is a remarkable stride in the right direction of protecting mankind from the inroads of disease; and in no better way can human maladies be reduced to a minimum than by destroying the disease-makers before they have an opportunity to get beyond the portals.

In the October 1914, number of the U. S. Naval Medical *Bulletin,* the writer published a report of six severe cases of pyorrhea, all of which were completely cured by this new method of treatment. The cure of some sixteen successive cases since then prompts this presentation to the dental profession.

It is not the writer's intention to discuss the various opinions held concerning the etiology of this prevalent disease, but in order that the purport of this report be understood, the following stand is taken: That pyorrhea is due to a local irritation which may be and often is predetermined by general debility and a starved condition of the tissues from lack of nutritive supply.

FIRST EXPERIENCE WITH SUCCINIMID OF MERCURY.

The use of succinimid of mercury in the treatment of this disease was first brought to the writer's attention wholly by chance at the Portsmouth navy yard. Two patients, who had been under local treatment for pyorrhea, presented themselves upon different days with gums swollen and exquisitely tender, and often with free salivation. Being unable to account for such conditions, which occurred at regular intervals, the patients were questioned, and the fact that they were also being treated for other troubles at the same time by Dr. Barton L. Wright, U. S. N., senior surgeon at the yard, was brought to light. Investigations showed that both patients were being given deep muscular injections of mercury at regular intervals, and that the changes in the gum tissues and their hypersensitiveness were usually most pronounced on the second day after injection. The surprisingly quick cessation of the pus flow from the pockets and the corresponding return to normal of the gum tissues led to the introduction of succinimid of mercury in other cases by Dr. Wright and myself.

DOSAGE.

Some twenty or more cases have since been treated by this method, and in every case a cure has been effected inside of four or five weeks. The doses of mercury given at the first injection —these injections being made deeply into gluteal muscles—varied according to the physical condition of the patient, but usually averaged about one grain. For the purpose of tabulation, this was divided into fractional fifths, the first dose usually being gr. 6/5 or gr. 5/5, and at each succeeding injection—at weekly intervals—a reduction of 1/5

gr., as the condition of the case and the patient required.

Dr. Barton L. Wright, surgeon, U. S. N., who had been using succinimid of mercury since 1905 with remarkable results, especially in diseases of vegetable parasitic origin, has demonstrated that "to produce the immediate curative effects, the dosage of the initial injection must be extremely large," and that "small and frequently repeated doses are not productive of rapid results, and when continued uninterruptedly unduly long, render the infecting organisms immune to their chemical affinity."

Quoting further from Dr. Wright—"I now believe that mercury has a dual parasitotropic action: First, primary or direct, in which the mercury by affinity unites with the organisms and without antibody binds complement; or, secondarily or indirect, in which the mercury stimulates the rapid production of specific antibody."

The investigations of Dr. Wright were carried out on the principle of Ehrlich's theory that "For every parasitic organism there is a chemical affinity, which, if found and injected into the infected host, would destroy the infecting organisms and therefore cure the specific disease."

Because of the rapid absorption required in mercurial treatment, Dr. Wright finds that mercuric succinimid, gr. 1.8 = metallic mercury gr. 0.909, is the most efficient of the soluble salts of mercury.

The danger of mercurialism is not very great, it having occurred only once during our investigations, and in that instance having been due to a mistake, the patient being given two injections on successive days. Should such symptoms occur, however, the injections should be at once stopped, and appropriate corrective measures applied. The bowels should be freely moved daily, and surgical asepsis carefully observed in every particular regarding syringe, needles, solution, and skin at the site of injection. While all of our cases have been males, the doses of mercury in females should average from 1/5 gr. to 2/5 gr. less than in males.

LOCAL TREATMENT.

The local treatment, consisting of the thorough removal of calcarious deposits, the extraction of hopeless teeth and roots, and the polishing of the tooth structure, was continued every other day during the course of treatment, Dr. D. D. Smith's prophylactic trimmers and scalers being used entirely. Broken-down tissues and sensitiveness of the necks of the teeth were reduced by a 10 per cent. solution of silver nitrate—which also prevented the discoloration which a higher per cent. solution would produce—and the patient instructed to apply equal parts of aconite, iodin, and chloroform daily as a counter-irritant, and to stimulate absorption.

At the completion of the treatment, prophylactic advice as to the care and use of the teeth was given each patient, and it is hoped that they will profit physically and mentally thereby.

SUMMARY OF CASES TREATED.

A summary of the cases, taken from Dr. Wright's case-book, is given below. It will be noted that in addition to the local action of the mercury in the clearance of the pus flow, an improvement in the general circulation and a systemic regeneration occurred in most cases. In other words, in curing the pyorrhea, nutritive balance, or normal health, is produced.

CASE 1. E. W. C., chief carpenter. The patient came under observation on May 4, 1914, complaining of severe pain, soreness and stiffness of the shoulder joints, and of the feet and ankles. This condition had existed for some years. Treatment at different times had proved of little benefit. For the past few months he had grown much worse, being hardly able to get out of bed or dress himself. He was under treatment for pyorrhea by A. A. Dental Surgeon P. G. White, who considered the case an extensive and bad one. A diagnosis of chronic infectious arthritis was made, the infection probably being due to the condition of the gums.

Injections of mercuric succinimid were given as follows: *May 4th*, gr. 7/5. Slight gingivitis, feels better. *11th*, gr. 5/5. *19th*, gr. 4/5. *23d*, entirely free from all symptoms. Dr. White reports pyorrhea cured. *24th*, gr. 4/5. *June 2d*, complains of pain in both hip joints; injection, gr. 4/5. *7th*, gr. 3/5. *13th*, gr. 4/5. *29th*, feels perfectly well; injection, gr. 3/5. *July 8th*, perfectly well; injection, gr. 3/5. Patient states that a large patch of eczema which has been present on the chest for the past thirty years has also disappeared.

Case 2. W. H. S., sergeant, U. S. M. C. This case was referred to me by Dr. White, with diagnosis of pyorrhea, the gums being soft, spongy, and retracted. Pus was exuding from around every tooth. The patient has a chronic arthritis of the left ankle, which is considered an autogenous infection from the local infection of gums.

Injections were made as follows: *June 29th*, gr. 6/5. *July 6th*, gr. 5/5. Marked improvement. *11th*, gr. 4/5. *17th*, gr. 4/5. All pain and swelling in the left ankle disappeared, gums normal. *21st*, apparently cured. The following two injections were given as a precautionary measure. *July 24th*, gr. 3/5. *31st*, gr. 2/5.

Case 3. C. E. R., chief yeoman. This case was referred to me by Dr. White, who had been treating the patient for about six weeks. There was extensive and severe infection which had shown slight improvement.

Injections of mercuric succinimid were given as follows: *June 29th*, gr. 5/5. *July 6th*, gr. 4/5. *11th*, gr. 3/5. *13th*, apparently cured. Three more injections were administered as a precautionary measure. *17th*, gr. 3/5. *24th*, gr. 2/5. *31st*, gr. 2/5.

Case 4. E. K., G. C. M. P. This case was referred by Dr. White. The patient presents soft spongy gums, which bleed freely, and are extremely tender and sensitive. Pus in large amounts discharges from around every tooth. The patient has a polyarthritis, both knees and botn ankle joints being infected. It is thought that this condition is probably an auto-infection.

Injections of mercuric succinimid were given as follows: *July 28th*, gr. 5/5, followed by marked improvement. *Aug. 3d*, gr. 4/5. By *August 6th* all symptoms had disappeared. *Aug. 18th*, no evidence of pyorrhea was present, but injections of gr. 4/5 were resumed as a precautionary measure. *Aug. 24th*, gr. 4/5. Pyorrhea and arthritis cured.

Case 5. S. K. The patient presented severe and extensive pyorrhea, subacute gonococcic urethritis and gonorrheal arthritis.

Injections of mercuric succinimid were given as follows: *Aug. 16th*, gr. 6/5. *25th*, gr. 4/5. *Sept. 2d*, gr. 4/5. *4th*, pyorrhea cured. *9th*, gr. 3/5. *16th*, gr. 3/5. No discharge from urethra for past ten days; urine free from shreds; arthritis cured.

Case 6. A. W. D. The patient was referred to Dr. White by P. A. Surgeon Wheeler for local treatment of a severe and extensive pyorrhea on August 19th. Dr. Wheeler had on August 18th injected mercuric succinimid gr. 6/5, the patient also having gonorrheal arthritis.

Aug. 19th, gr. 5/5; gingivitis followed. *26th*, gums still slightly tender, but pus has entirely disappeared. *Sept. 2d*, gr. 4/5. Pyorrhea and arthritis cured.

Case 7. J. J. M. The patient presented extensive and severe pyorrhea.

Injections of mercuric succinimid were made as follows: *Aug. 18th*, gr. 5/5; marked improvement followed immediately. *24th*, gr. 4/5. *30th*, cured. *31st*, gr. 4/5, as a precautionary measure.

Case 8. L. P., corporal, marines. The patient presented a moderately severe case of pyorrhea, involving the processes of the upper and lower central teeth.

Injections of mercuric succinimid were given as follows: *Aug. 27th*, gr. 5/5. *Sept. 2d*, gr. 4/5. *4th*, cured; no further treatment.

Case 9. W. C. E. The patient presented a mild case of polyarthritis, involving both knees and ankles.

Injections of mercuric succinimid were administered as follows: *Sept. 14th*, gr. 5/5. *17th*, pyorrhea and arthritis cured.

Case 10. E. S. J. The patient presented a mild case of pyorrhea, involving the processes of all upper teeth.

Injections of mercuric succinimid were given as follows: *Sept. 25th*, gr. 6/5. *28th*, cured.

Case 11. T. J. G., P. M. The patient presented a mild case of pyorrhea, involving the processes of the lower teeth.

Injections of mercuric succinimid were given as follows: *Sept. 25th*, gr. 5/5. *28th*, cured.

Case 12. W. J. S., chief quartermaster. The patient presented a severe case of pyorrhea, involving the processes of all teeth, all of which were loose. He complained of indigestion and very poor appetite.

Injections of mercuric succinimid were made as follows: *Sept. 5th*, gr. 5/5. *12th*, gr. 5/5. *19th*, gr. 3/5. *22d*, cured. The gas-

tric symptoms had disappeared, the patient having an excellent appetite.

Case 13. R. B. C., man-at-arms, 1st cl. The patient presented a severe case of pyorrhea, involving the processes of all teeth, all of them being loose, and with an abscess of the right upper jaw and severe bilateral facial neuralgia. The abscess was incised and drained.

Injections of mercuric succinimid were given as follows: *Sept. 5th*, gr. 5/5. *6th*, neuralgia had disappeared. *12th*, gr. 5/5. *19th*, gr. 3/5. Markedly improved. *26th*, gr. 4/5. *Oct. 2d*, gr. 3/5. Cured.

Case 14. E. B. The patient presented a moderate case of pyorrhea of the upper and lower central teeth, and polyarthritis involving the knees and ankles.

Injections of mercuric succinimid were given as follows: *Oct. 5th*, gr. 5/5. *12th*, gr. 5/5. *19th*, gr. 4/5. *21st*, pyorrhea and arthritis cured.

Case 15. O. S. P. The patient presented a severe case of pyorrhea, involving the processes of all teeth.

Injections of mercuric succinimid were given as follows: *Oct. 8th*, gr. 5/5. *15th*, gr. 4/5. *21st*, cured. *23d*, an injection of gr. 3/5 was given as a precautionary measure.

Case 16. L. A., coxswain. The patient presented a severe case of pyorrhea, the processes of all teeth being involved, the gums exhibiting extreme recession, being soft, spongy, and bleeding.

Injections of mercuric succinimid were given as follows: *Oct. 12th*, gr. 5/5. *19th*, gr. 5/5. *26th*, gr. 5/5. *31st*, cured.

Case 17. J. E. B. The patient presented a mild case of pyorrhea.

Injections of mercuric succinimid were given as follows: *Oct. 20th*, gr. 5/5. *25th*, cured.

Case 18. J. F. W. The patient presented a severe case of pyorrhea, involving the processes of all teeth.

Injections of mercuric succinimid were given as follows: *Oct. 26th*, gr. 5/5. *Nov. 3d*, gr. 5/5. *6th*, cured.

Case 19. F. R. The patient presented a case of pyorrhea, moderate in extent and severity.

Injections of mercuric succinimid were given as follows: *Oct. 31st*, gr. 5/5. *Nov. 7th*, gr. 5/5. *9th*, cured.

Case 20. D. D., P. M. The patient presented a mild case of pyorrhea, the processes of the upper molars and lower central teeth being involved. There was marked recession of the gums.

Injections of mercuric succinimid were given as follows: *Nov. 4th*, gr. 5/5. *11th*, gr. 5/5. *14th*, cured.

Case 21. M. M., F., 1st cl. The patient presented a severe case of pyorrhea, moderately extensive.

Injections of mercuric succinimid were given as follows: *Nov. 3d*, gr. 5/5. *10th*, gr. 5/5. *17th*, gr. 5/5. *20th*, cured.

Case 22. C. O. M., C. man-at-arms. The patient presented a case of pyorrhea, extensive calcarious deposits and gum recession, and a free flow of pus from the upper molars and lower central teeth.

Injections of mercuric succinimid were given as follows: *Nov. 7th*, gr. 5/5. *14th*, gr. 5/5. *19th*, gr. 5/5. *20th*, cured.

Case 23. A. W. O. The patient presented a case of pyorrhea, calcarious deposits and extreme gum recession, also discharge of pus from around every tooth. He stated that he was subject to frequent attacks of laryngitis and tonsillitis.

Injections of mercuric succinimid were given as follows: *Nov. 14th*, gr. 5/5. *20th*, Dr. White reported to me this case as follows: "Wonderful improvement. Pus wholly gone, except around lower anterior teeth, where the flow has diminished one-half."

Case 24. L. P. F. The patient presented a case of pyorrhea, extremely severe, and very extensive calcarious deposits under the gums, which were extremely tender and sensitive, a free flow of pus from around all teeth, and severe arthritis of the knee joints.

Injections of mercuric succinimid were given as follows: *Nov. 2d*, gr. 6/5. *9th*, gr. 5/5. These were followed by an immediate and marked improvement in the arthritis of the knees. By *Nov. 16th*, the joint symptoms had disappeared, and the patient was referred to Dr. White. *Nov. 16th*, gr. 6/5. *20th*, Dr. White reported "Improvement."

There has been no return of pyorrhea or arthritis in any of these cases to date.

THE X-RAY AS AN AID IN DIAGNOSIS.

By GILLESPIE ENLOE, D.D.S., Atlanta, Ga.

(Read before the union meeting of the Georgia State Dental Society and the Southern Branch of the National Dental Association, at Atlanta, Ga., June 4, 1914.)

IN presenting this subject it is my purpose to do so in as simple a manner as possible, leaving out the discussion of all scientific features, but hoping that the hearer will wonder, as I now wonder, how he has practiced dentistry so long without the aid of the radiograph.

In the preparation of the paper I have appropriated the best of all that I could find on this subject, and do not claim originality for all the subject-matter, although it has been my good fortune to radiograph nearly every case described and to observe the features mentioned. Making no attempt to cover the whole field, I simply wish to call attention to cases, such as present daily in an ordinary practice, in which the radiograph will help the operator to a better understanding of his work.

DELAYED ERUPTION.

In cases of delayed eruption the radiograph is employed to determine the presence or absence of unerupted teeth. When there seems to be congenital absence of a tooth from the jaw, it is expedient, to express it mildly, to make an X-ray before making and setting a bridge.

With the exception of the third molars, no teeth are so liable to be delayed in their eruption as the upper canines; for this reason we should be very careful about bridge work here, as one of the most embarrassing experiences for a dentist is the setting of a bridge in this space and having a canine erupt shortly after under his appliance.

PROLONGED RETENTION OF DECIDUOUS TEETH.

In cases where deciduous teeth have been retained, long after they should have been exfoliated, the radiograph will show whether permanent teeth are present.

We frequently have young people between the ages of seventeen and twenty-two apply for treatment or filling, with deciduous teeth still in the mouth and firm in position, and it is up to us to decide whether to extract these teeth or treat and fill them. An X-ray will decide the question accurately, and possibly save the operator a great deal of time, embarrassment, and perhaps loss of the patient.

DEVELOPMENT OF ROOTS OF PERMANENT TEETH.

The radiograph will reveal whether the roots of children's permanent teeth are fully developed. What should the operator do when a child of from six to eight years of age comes into his office with a badly broken down first molar with exposed pulp, causing severe toothache? or, the pulp not being exposed, the removal of all decalcified dentin means an extensive exposure, and therefore devitalization, extirpation, and root-canal filling? Should we practice devitalization in such cases? If the roots are fully developed, Yes.

Often a child meets with some accident which breaks off the angle of a central or lateral incisor, and the resto-

ration of the angle sometimes necessitates the removal of the pulp and the placing of a post in the canal. In such cases the question always is, Is the root fully developed? If it is, we may proceed with the devitalization, but if not we use some temporary restoration and preserve the pulp until it has fulfilled its function of root development. We occasionally find an anterior tooth in a child's mouth so badly broken down that crowning is indicated, and again the same question confronts us: Is the root fully developed? Whether we should keep the tooth temporarily repaired with cement for a year or two, or devitalize and crown it, depends entirely on the answer to these questions given by the radiograph.

IMPACTED TEETH.

In cases of impacted teeth, the radiograph is an invaluable aid to extraction. Careful study of a radiograph will show the dentist the best method of preparation for extraction; just where to cut away overlying or impacted parts, how much bone or process to dissect away before the malposed tooth can be removed, and where to apply force in the extracting operation.

Patients seldom realize that the removal of a tooth is not always a simple operation, and are inclined to blame the operator if the tooth is not quickly removed, instead of crediting him with working dextrously in a difficult operation. They are likewise unwilling to pay a fee proportionate to the difficulty of the operation, as compared with other operations. I frequently tell such patients that the extraction of an impacted third molar is a more difficult operation than the removal of a vermiform appendix. By showing radiographs of such cases, the dentist will gain his patients' earnest, intelligent co-operation; they will know just what is being done for them, and for the first time in their lives they will understand that the extraction of a tooth may be a serious, difficult, and expensive operation.

FILLING OF ROOT-CANALS. PERFORATIONS.

The radiograph further enables the operator to learn if root-canals have been opened and enlarged to the apex before filling, and to observe the root-canal filling after the operation.

In tortuous canals we never know, to a certainty, when our work has been properly done, even though we enlarge the canal with sulfuric acid, being most careful with details; even when this has been well done we sometimes fail to reach the apex with a gutta-percha filling. The use of the X-ray eliminates all guesswork; we know what we are doing.

Lots of perforations would never be made if we would take the trouble to ascertain the direction of the roots before we begin opening them up. If the roots are unusually short, a radiogram will keep us from going through at the apex; and if they are unusually long, we do not stop short of the apex in our work. The patient can be shown the X-ray and informed, as nothing else will tell him, just what the operator is doing for him.

ALVEOLAR ABSCESS.

For locating the tooth responsible for an alveolar abscess the radiograph is indispensable. A patient recently presented himself with a Richmond crown which had been set several years before and was apparently the seat of a chronic abscess, but when an X-ray was taken, the trouble was located on the root of the adjacent tooth. He was a dentist, and it was difficult to persuade him that the other tooth was causing all the trouble, until it was opened up. In chronic abscesses of long standing a radiograph will show the extent of destruction of tissue, both bony and dental. In large abscess areas it can be determined just how many teeth are involved, and at the apices of which teeth do abscesses exist. In crowned teeth the abscessed roots, and in devitalized teeth

improperly filled root-canals are revealed.

It is a common occurrence in practice to have a patient present a pus sinus discharging in the region of the apex of a crowned tooth. If the root has been properly filled we should treat the sinus through the external alveolar plate; if not, the crown should be removed and the treatment effected through the root. The radiograph will determine which course should be pursued.

ROOT AMPUTATION.

The radiograph is a necessity for observing the field of operation before and after root amputation. When a tooth fails to respond to less radical treatment, and it is deemed necessary to amputate a portion of the apex of the root, the question naturally arises. How much shall we cut off? A good radiograph answers the question.

LOCATING FOREIGN BODIES.

For locating foreign bodies, such as a broach, in a root-canal, or a piece of a wooden toothpick in the peridental membrane, the radiograph is a valuable aid. One of the most painful cases which have come under my observation was that of a man who appeared to be suffering from neuralgic pains, none of his teeth being tender to either percussion or pressure, and there being apparently no inflammation. A radiograph showed a shadow against the mesial root of the third molar. Inquiry developed the fact that the patient was accustomed to use wooden toothpicks, and upon extracting the third molar a piece of toothpick was found embedded in the membrane of the molar. After this all pain ceased.

DISCOVERING TOOTH FRAGMENTS AFTER EXTRACTIONS.

The radiograph enables the operator to determine the presence or absence of a small fragment of tooth in the gum after several teeth have been extracted. Patients frequently come in several days after an extraction, complaining of very sore gums, and want to know whether a piece of tooth has been left in the mouth. Unless a radiograph is used, the parts will have to be anesthetized with a local anesthetic, and some of the soft tissues dissected away, to determine whether the inflammation is due to an unremoved fragment of tooth or a small portion of fractured process—all of which would take time and cause the patient annoyance and some pain.

DIAGNOSIS OF ROOT FRACTURE.

For diagnosis of fracture of a root, the radiograph is a most rational expedient, which should be resorted to in all cases of traumatism before treatment is begun. How can we know, without a radiograph, how to treat a case of this description? Suppose a patient presents for treatment after having loosened both upper centrals by a fall, with inflamed gums and pain intolerable on percussion.

Such a case I treated by extirpating both inflamed pulps and filling the root-canals, after which one tooth immediately resumed a normal condition, while the other remained loose and sore. A radiograph was taken, which showed the loose tooth to be fractured near the apex. Upon removing the fractured parts, and smoothing the end of the broken root, this tooth was also restored to normal.

CONTROLLING SIZE AND SHAPE OF ROOTS OF ABUTMENT TEETH IN CROWN AND BRIDGE WORK.

For observing the size and shape of the roots of teeth to be used as abutments in crown and bridge work the radiograph is the most useful accessory. Occasionally we meet with cases of "peg laterals" in the upper jaw, where crowning is indicated, and the usual practice is to place jacket crowns on them. But we all know that this kind of crown is weak at best, is difficult to construct, and very fragile: if the root is long and

strong enough to support some kind of pin crown we may render our patients better service if such a crown is used—and the only sure method of obtaining this information is the use of the X-ray.

ENLARGING ROOT-CANALS FOR POSTS.

When enlarging root-canals for crown posts, the radiograph is a great safeguard. Sometimes when enlarging root-canals we lose the course of the canal, and are at a loss as to whether we are proceeding in the right direction. A wire is placed in the root-canal, and a radiograph made. If there is any danger of a perforation mesially or distally, the radiograph will show it.

EXAMINATION OF INFLAMMATION AROUND BRIDGES.

In examining bridges about which there is inflammation the radiograph is used for determining the inflammatory focus. Fixed bridges are at best none too sanitary, and for this reason we often find intense inflammation about them. Frequently the irritant consists in cement forced into the tissues around a shell-crown abutment, causing an inflamed condition which can only be cured by removal of the cement. Our only means of finding its location is an X-ray.

In observing the field before constructing a bridge, the radiograph will not only disclose the presence of unerupted teeth and unremoved tooth-roots, but will show the operator the size, shape, inclination, and condition of the roots designed for abutments.

FRACTURES.

In cases of fracture of the jaw the X-ray becomes a necessity. Fracture of the mandible is almost always accompanied with so much swelling that digital and ocular examination is very unsatisfactory. The operator who treats a fracture should know just where it is situated, and what kind of fracture he has to deal with, and if there is displacement of the fragments he must know how much and in what direction the displacement has occurred, in order that he may properly readjust the parts. This information can be given by the X-ray only.

TRISMUS.

In cases where the patient cannot open the mouth widely enough for ocular examination—when, for example, an impacted lower third molar is causing a false ankylosis—we may suspect the molar to be the exciting cause, but we cannot be sure of this ourselves nor demonstrate it to others without the use of the X-ray.

RECORDS OF WORK ACCOMPLISHED.

In recording any work done, the X-ray can be put to valuable use. Any kind of record of work done is valuable, and records of extractions, root-fillings, and crowns are at times invaluable to the operator. In cases of trial for malpractice such records would prove conclusively the operator's position, being incontrovertible evidence. Suppose a patient had to go to a hospital after an extraction of a badly impacted lower third molar and should sue the dentist and swear at the trial that he had broken the jaw, would it not be of the greatest value to the defendant if he had taken a radiograph after finishing the operation?

CONCLUSION.

In conclusion, the best argument in favor of the use of the radiograph in dentistry is that it furnishes evidence that none can gainsay or disprove, and that it brings to light hidden conditions which can be revealed in no other way.

THE NATIONAL NARCOTIC (HARRISON) LAW AS IT AFFECTS THE DENTAL PRACTITIONER.

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ON March 1, 1915, the National Narcotic (Harrison) Law went into effect. This law has in many respects a direct bearing on the practice of dentistry, as the two basic drugs to which it refers—namely, opium and cocain and their derivatives—are quite frequently employed by the dental practitioner. In the absence of regulations from the bureau of Internal Revenue it is impossible at this moment to lay down specific rules for the dentist. However, a synopsis of the law in its relationship to the dental practitioner is herewith appended:

SYNOPSIS OF THE HARRISON LAW.

(1) The law provides that on and after March 1, 1915, every person, firm, or corporation that imports, manufactures, compounds, deals in, disposes of, sells, distributes, or gives away opium, or coca leaves, or any compound, manufacture, salt, derivative, or preparation thereof, shall register with the Collector of Internal Revenue of the district in which he resides, his name or style and his place of business. At the time of registering, and on or before July 1st annually thereafter, every such person shall pay to the said collector a tax of one dollar.

(2) The specified drugs may be purchased only upon official order blanks issued by the Internal Revenue department, at a cost of one cent each for each original order or duplicate thereof. Whenever the dentist orders any of the above-named drugs he must fill out the official order blank, retaining the duplicate copy thereof for two years and in a manner open to inspection by the proper authorities.

(3) The dispensing or distribution of any of the aforesaid drugs to a patient by a dentist duly registered under the act, in the course of his professional practice only, is not interfered with by this law, nor does the law apply to the sale or disposal in any way of the said drugs by a dealer on the written prescription of a dentist. But such prescriptions must be dated as of the date on which they were signed and must bear the signature of the dentist who issued the same. A duplicate copy thereof should be retained for two years by the prescriber.

(4) The law exempts from its provisions all preparations and remedies which do not contain more than two grains of opium, or more than one-fourth grain of morphin, or more than one-eighth grain of heroin, or more than one grain of codein, or of any salt or derivative of any of them, in one fluid-ounce, or, if a solid or semisolid preparation, in one avoirdupois ounce; all liniments, ointments, and preparations which are prepared for external use only, except liniments, ointments, and other preparations which contain cocain or any of its salts, or alpha or beta eucain, or any of its salts, or any synthetic substitute for them. The exemptions as to the preparations above named apply only when they are sold, distributed, given away, dispensed, or otherwise disposed of as medicines and not for the purpose of evading the provisions of the act.

(5) It is a crime under the act for any person who is not registered and has

not paid the tax to have in his possession or under his control any of the aforesaid drugs, and such possession will be construed as presumptive evidence of a violation of the act. This provision, however, does not apply to any employee of a registered person, or to a nurse under the supervision of a dentist registered under the act, having such possession by virtue of his employment or occupation and not on his own account.

The penalty for violating any of the requirements of the act is a fine of $2000, or imprisonment for not more than five years, or both, in the discretion of the court.

From all appearances, all local anesthetic solutions, tablets, pellets, pastes, etc., containing cocain or opium, or any of their derivatives, are amenable to this law.

According to a ruling of the Treasury department dated February 26, 1915, the following statement concerning the substitutes of cocain has been issued:

> The question as to whether novocain and similar preparations come under the provisions of the Harrison Narcotic Law as synthetic substitutes for cocain is now under consideration. Until this question is fully determined, novocain and similar preparations the exact character of which has not been fully established will not be held as coming within the scope of this law.

Tropacocain is a synthetic product of cocain, consequently its sale will be governed by the law, while chloretone, *i.e.* acetone-chloroform, and quinin and urea hydrochlorid are not affected by it.

The practitioner who purchases ready-made solutions, tablets or other pharmaceutical compounds should carefully read the attached labels so as to familiarize himself with the components of the respective preparations. Aside from the before-mentioned drugs there are a number of pharmaceutical preparations employed by the dental practitioner upon which the new law has a direct bearing. The most important compounds are herewith enumerated: Fluid extracts, tinctures, and elixirs, powders, pills, tablets (compressed and hypodermic), and pastes containing opium, coca, or their derivatives, such preparations including the following compounds: Warburg's tincture, Dover's powders; paregoric, ipecac, and opium pills, Brown's chlorodyne, brown troches, Tully's powder, opium and lead wash, some of the anti-neuralgic liniments, most of the pulp devitalizing compounds, and such local styptics as stypticin (cotarnin hydrochlorid) or styptol (cotarnin phthalate), and the occasionally internally employed hemostatic—the camphor, opium, and lead-acetate pill. Many of the anodyne compounds which are administered by the dentist as pain-relievers contain opium or its derivatives, *i.e.* codein, heroin, morphin, etc. Incidentally this is equally true of most cholera drops and cough mixtures. Preparations for the mouth and teeth in the form of washes, powders, pastes, and soaps are usually free from opium or cocain admixtures, while a number of other pharmaceutical compounds used by the dentist contain these drugs. Merely to enumerate a few, the following preparations may serve as examples: A widely advertised abscess cure contains morphin: mummifying pastes are known to contain cocain. This is equally true of certain antiseptic and anesthetic pastes employed for polishing teeth and massaging the gums. It may seem ridiculous, but nevertheless it is true that even some root-filling compounds are known to contain morphin.

THE CHEMISTRY OF DENTAL AMALGAM ALLOYS, WITH SOME CONSIDERATIONS CONCERNING THEIR PHYSICAL PROPERTIES.

By WM. W. ATKINSON, Philadelphia, Pa.

(Read before the Clinical Club, Newark, N. J., October 28, 1914.)

ROBERTS-AUSTEN, in speaking of the work of the modern metallurgist,* says: "The chief point proved by these researches is that all of the properties of the alloys, and therefore their industrial value, depend directly upon two factors: (I) Their *chemical* constitution; that is to say, the relative properties of (*a*) the component metals, (*b*) the chemical compounds formed by these metals, (*c*) the isomorphous mixtures, or (*d*) the various allotropic modifications of the constituents. (II) Their *physical* constitution or structure; that is, the shape and dimensions of the crystals of the elementary constituents which, by their juxtaposition, constitute the metallic mass. The first aim of a systematic study of alloys must be to ascertain their chemical constitution or structure, and its final aim must be the study of the relation existing between these ascertained factors and their useful properties."

Such a consideration of the subject of dental amalgam alloy must dispel the uncertainty that has ever obtained regarding that important material. Dental metallurgists, after many years of more or less empirical experimentation, have established the metals best suited for the purpose, as well as the physical requirements for an amalgam filling. Silver-tin has been proved to be the basic alloy, and after it was ascertained that gold, zinc, and other metals failed to confer desirable qualities, copper has been found by the majority of investigators to be the only metal of value as a modifier of that base.

The requirements that have been established are, that there should be a slight expansion to prevent the ingress of bacteria, but not so pronounced as to break frail cavity walls or to interfere with the articulation of the opposing teeth; the final stage of setting should be quickly attained, and there should be no after-changes in form; there should be also rigidity, strength, and resistance to corrosion. By empirical work, however, no scientific formula has been deduced nor any manufacturing process evolved whereby these requirements could all be met. We must turn, therefore, to the scientific study of alloys as outlined by Roberts-Austen, the method for which is afforded by metallography—a study of the inner constitution and structure of the metals and their alloys. In this work are applied all of the resources of physical chemistry, of which it is a most important branch. By means of charts plotted in values denoted by curves, it visualizes its results, so that the narrower definition which we sometimes meet, of the mere microscopic investigation of the internal structure and constitution of alloys, does not obtain—for it is an all-inclusive science which searches by any or every means at its command the reasons for all of the phenomena of metals and alloys of metals, and the relationship of these phenomena to their physico-chemical properties.

* "An Introduction to the Study of Metallurgy," page 211.

Percentages dealt with are, as a rule, atomic percentages, and the various combinations of these in alloys are termed "concentrations" of given metals. Numerically these concentrations are regarded as "systems," thus any two metals in any concentration are in the "binary" system, three metals are in the "ternary system," four metals in the "quaternary system," etc. Those concentrations that fall under a system are termed a "series." For example, in the three metals with which we are to deal (silver, tin and copper) there are two "systems" and four "series" involved. In them we find the silver-tin, the silver-copper, and the copper-tin series of the binary systems, and the silver-tin-copper series of the ternary system.

The liquid or melted state of a metal or of an alloy of metals is known as the "liquidus phase," and the solid or frozen state as the "solidus phase." These phases can be coexistent—as, for example, where either chemical compounds or crystals of pure metals freeze out from a cooling mass of melted alloy. As cooling progresses, the "liquidus" state disappears, and the mass freezes completely, and is then in the "solidus" phase. In such a case the first portions to freeze out are called "solutes," and the last portion is the "solvent" or "mother lye." There is also the gaseous or vapor phase, but in practical metallurgical work this is a negligible quantity.

Classification of Alloys.

Alloys are classified in accordance with their constitution, and we shall treat of several of the divisions in the order of their importance to dental amalgams.

I. Chemical compounds of metals with metals form a highly interesting and important division. They form a large group of alloys in which the atoms of the metals are built up, by the force of chemical affinity, into chemical molecules, with the components in the ratios of their atomic weights. These compounds form during the cooling of a melted alloy, just as salts form under like conditions; the analogy is complete, for in each case there is first absorption of thermal energy which frees the atoms, and then a loss of thermal energy which permits the operation of chemical energy and the formation of the true chemical molecules.

We speak of the salts of the halogens as "halides," and we may, with equal force, speak of the chemical compounds of metals as "metalides." These form within an excess of one or more of their constituent metals, in which case they are termed "inter-metallic" compounds; or they may be formed by correctly melting together the required metals in the ratios of their atomic weights, then pouring the melted mass, at a temperature slightly above the heat of formation, into a well-chilled ingot mold. All chemical compounds of metals are homogeneous, but their valencies, that is their numerical combining values, do not conform necessarily to their known valencies in relation to the other elements; yet the metals are subject to the operation of the periodic law to the extent that when they fall in a vertical column of the periodic table we do not expect them to form compounds with each other, yet compounds are formed between many of the metals on the horizontal lines. Thus in the vertical column I of the periodic table, we find the metals Ag, Cu, which form no compounds with each other, yet copper combines chemically with tin to form the compound Cu_3Sn, which compound forms the basis of the bronzes, and is the hard constituent of dental amalgam alloys. Copper also combines chemically with zinc, forming the compounds Cu_2Zn and Cu_2Zn_3, these being the bases of the brasses. Silver combines chemically with tin, forming the compound Ag_3Sn, the basis of all dental amalgam alloys, which compound, so far as the writer knows, is of no other practical use. There is a hypothetical compound of silver and mercury, Ag_3Hg_4. This is supposed, by some writers, to contribute the property of "setting" to dental amalgams. The appendix to "Metallography," by C. H. Desch, 1913, con-

tains a list of one-hundred-and-nine chemical compounds, which number, the author says, is certain to be very greatly increased during the next few years.

It is in chemical compounds that all of the physical properties of the constituent metals undergo the most profound changes. These properties are never the mean of the properties of the component metals—that is, they are never the sum nor the accumulation of those properties. Thus, most chemical compounds of metals are harder, less ductile, of greater compressive strength, of markedly different specific weight, of lower electrical conductivity, different color, and possess greater resistance to corrosion than any other types of alloys. These differences are well marked in the compounds Ag_3Sn and Cu_3Sn.

If we follow the question of chemical affinity into the realm of scientific conjecture known as the electronic theory, we find that the atom, which was formerly supposed to be the ultimate division of matter, is divided into corpuscles intermingled with negative and positive electrons, and to this theory we must look for an explanation of valency. Samuel Smiles, in "The Relations Between Chemical Constitution and Some Physical Properties," 1910, says: "The chief line of advance has been made through the corpuscular theory of matter introduced by J. J. Thomson. According to this theory, valency must be regarded as an electrical phenomenon. The affinity of the atom is occasioned by the instability of the system of corpuscles composing the atom. In order to attain a condition of stable equilibrium, one or more 'electrons' must be expelled from the system, and the number of electrons (or groups of electrons) which are thus rendered mobile determines the valency of the element." On page 545 he says: "This problem of the nature of valency is undoubtedly the most important of those awaiting solution from the chemist. The opinion of the chemists seems divided as to whether the electronic theory can be accepted or not. Against its adoption it is urged that the electron is nothing but a figment of the physicist's imagination, and that chemists can derive no real benefit from it. But it may be pertinently asked whether the atom is not equally the figment of the chemist's imagination, and are we to reject this also? At present, however, the electronic theory seems to be the only means by which there is any prospect of attaining further knowledge of the nature of valency, and this circumstance alone should be sufficient recommendation for a thorough trial. At any rate, if we reject it, we have nothing else to offer as an adequate substitute. Moreover, the electronic theory offers some mechanical conception of the process of chemical union, and, although mechanical ideas are apt to mislead if followed too far, it should be remembered that the chemist has always found them to be peculiarly adapted to his needs."

"The Theory of Valency," by J. Newton Friend, 1909, contains a history of the electro-chemical theories from that of Sir Humphry Davy, 1806, to the present day.

II. Solid solutions. Metallurgists generally had, until metallographic research established the individuality of different mixtures of metals, and so classified them into groups according to their physico-chemical characteristics, regarded most alloys as "solid cold solutions," whereas it is now known that this is but one of their several divisions. Under chemical compounds of metals with metals we have dealt with atomic combinations—that is, with alloys in which the structure is that of chemical molecules composed of two or more atoms of two or more metals that have chemical affinity for each other.

In solid solutions, however, we have to deal with alloys in which the structure is that of crystals in which two or more metals are dissolved. Here some of the forces of chemical affinity are not in evidence, and it is fair to assume that the constitution is molecular in character. These molecules are not chemical combinations of atoms of different metals, but each molecule consists of the atoms of a single metal in intimate as-

sociation or solution with like molecules of other metals, in the crystals. This gives rise to the term "mixed crystals," by which term solid solutions are sometimes classified. Solid solutions, then, are physical mixtures of the molecules of pure metals built up into isomorphous crystals, the shape of which is determined by that metal which is in excess. Solid solutions, when in a state of thorough diffusion, are homogeneous. Their physical properties are changed, but not to such a degree as are those of chemical compounds; in fact, there are additive properties. Examples of alloys which are solid solutions are gold-silver, copper-gold, and copper-platinum. These form solid solutions throughout. In dental amalgam alloys, however, the solid solution must be conceived of as an unappropriated portion, the formation of which depends mainly upon considerations of temperature and concentrations. The subject of solid solutions is comprehensively treated in Desch's "Metallography."

III. Eutectics. A eutectic is defined as that concentration of any series which has a lower melting-point than any other concentration in the series. Thus, through the intimate association of two or more metals, by the operation of melting, we sometimes find that there has been a mutual depression of their melting-points, so that the resultant alloy melts at a considerably lower temperature than that of the mean of the constituent metals. A eutectic is always a mechanical mixture of metals, that is, its metals are only in physical juxtaposition, and are not dissolved in each other. The structure is that of intimately mixed microscopic portions of pure metals, which exist either as leaves, globules, or crystallites, or of a mixture of two or more inter-metallic compounds. In several of the writings of dental metallurgists we encounter the term "eutectic" applied to the phenomenon of the liquefying of a portion of an ingot of alloy upon its being remelted, this taking place at a lower temperature than that required for the melting of the entire mass of alloy, and manifesting itself as globules distributed over the surface of the ingot like those which appear on the surface of a button of copper amalgam when the dentist heats it in preparation for a filling.

It is the eutectic, but these writers often attribute this phenomenon to poor melting, and assume that certain of the contained metals had, as a result of such error, not gone into "solution," and that this could be corrected by remelting the ingot and carrying it to a higher temperature than had previously been done. This phenomenon, however, is considered by metallographists to be one of the phases of a heterogeneous alloy. To illustrate this, using an ordinary dental amalgam alloy, we have therein various combinations, according to the desire of the manufacturer, of silver, tin, copper, zinc, gold, platinum, etc. Between these metals is possible a long series of chemical compounds, solid solutions, and eutectics. The cooling of the alloy gives rise to the formation of several of these series, and the first to solidify is that chemical compound or solid solution which has the highest melting-point, this being followed successively by those concentrations which have lower melting-points; so that the last portion to freeze out is the last "liquidus" phase existing in the alloy outside the first-formed crystals. Further cooling results in the solidification of the whole mass, when two or more separate "solidus" phases are coexistent, each with a different melting-point. When the alloy is again heated, we find the "eutectic" to melt first and to show as globules over the surface of the ingot, and the alloy to be resolved into the liquidus and solidus phases. The liquidus phase may be a low-melting chemical compound of metals, or what is more often the case, a solid solution of excess metals, or a conglomerate, according to whether the excess is of high or low melting-point, this depending upon considerations of chemical affinity of greater or less degree. Eutectics of importance to our subject are Hg-Zn, formed at 1 atomic per cent. Zn, with a freezing-point of —42.5°C.; Hg-Sn, formed at nearly 100 atomic per cent.;

Hg, freezing-point not established; and Ag-Cu, formed at 60 atomic per cent. Ag, freezing-point 778°C. (Desch.) It will be seen that, in an amalgam filling of the ordinary type, two eutectics are possible which would have an effect upon the freezing-point which we term "setting." Also there is possible the last-named eutectic of Ag-Cu, which forms at 60 atomic per cent. Ag. at a temperature of 778°C. This eutectic is known as Levol's alloy, and was erroneously announced by its discoverer, A. Levol, as a chemical compound having the formula Ag_3Cu_2, in the (French) *Journal of Pharmaceutical Chemistry*, 1850, but through the researches of Guthrie, Roberts-Austen, Haycock and Neville, and others, it was long ago proved that it is not a chemical compound, but a physical mixture of copper-silver, the true eutectic of the series.

A eutectic widely used in dentistry is that of Bi-Sn. It is known as fusible metal, and is used for casting lower plates and inlays.

Eutectic alloys possess qualities that are in a degree additive. Thus their electrical and thermal conductivity are said to be sometimes a linear function of their composition, and their color is sometimes a blend of the colors of the component metals. Eutectics, as a rule, are more brittle, less malleable, and of lower tensile and compressive strength than any of their constituents. They are also more easily corroded than are other types of alloys.

General Considerations.

We have so far dealt with the constitutions of alloys, and we shall now take into consideration the properties that result therefrom. Dental or other alloys rarely conform to any one of the main divisions which we have noted, but are more often conglomerates of two or more of them. Thus there may coexist in an ingot of alloy several phases in the solidus of compounds, solid solutions, and eutectics, and the alloy would be entirely out of such physical equilibrium as is required for dental purposes.

These questions as to constitution must be determined by methods of metallography—which are, first, the plotting of a cooling curve by pyrometric tests, which are checked by microscopic study of the sections of the ingot in order that the structure so revealed shall confirm the findings of the pyrometer. It is unnecessary now to enter into details of this work, as works on the subject of metallography contain treatises upon these methods of investigation.

Corrosion.

Corrosion, usually termed discoloration in dentistry, arises from the fact that any two metals in juxtaposition form, in the presence of a fluid solvent termed an electrolyte, a galvanic pair, the members of which are positive and negative to each other, and are called respectively anode and cathode. In such pairs the positive member or anode is dissolved in proportion to its degree of solubility in the particular electrolyte in which it is immersed. Industrial application of this principle is found in electro-plating various objects with gold, silver, nickel, copper, and brass, also in the electrolytic refining of many metals —such as gold, silver, copper, and tin. Alloys may be resolved by electrolysis into their several constituent metals, but there is an order of solubility dependent upon the factors of physical and chemical constitution and the activity of the electrolyte upon the metals in any given combination. In these industrial operations the electrical impulse is given from without, either by a battery of generating cells or by an electric dynamo, but the principle in all cases is the same. The conglomerates are the alloys most susceptible to electrolytic action, and are followed in the given order by eutectics, solid solutions, and chemical compounds. Thus it is seen that of all alloys, chemical compounds best resist corrosion. Zinc is positive to every other metal that is used in dental amalgam alloys, and as a result of this it is the first to dissolve by electrolytic action in the mouth. This causes the filling which contains it

to become porous, and the zinc as well as the other metals are exposed to the action of the sulfids and chlorids in the saliva, which causes the blackening of the filling and the staining of the tooth. Zinc has been advocated for the whiteness which it is supposed to confer upon amalgam fillings, but it can be seen that this whiteness is transitory. Desch's "Metallography" contains a chapter on corrosion which thoroughly sustains these conclusions as to corrosion.

VOLUME CHANGE.

It is known that certain alloys undergo condensation in freezing, that certain other alloys undergo expansion in freezing, and that others retain the ideal volume of the average of their component metals, and are then considered to be in volume equilibrium. Thus the copper-tin series show marked contractions over a considerable range of concentrations; the copper-silver series show expansion for that range of concentrations lying between 5 and 45 per cent. copper. In the mercury-zinc series there is volume equilibrium, that is, over the entire range the volume corresponds to that of the average of the components. In other alloys there are all three states according to the ratios in which their component metals are present. Volume determinations are surrounded by every precaution of scientific control to insure accurate results. The metals must be of the greatest purity, and each metal must have its specific volume determined under the exact conditions that obtain in the volume determination of the alloys. If, for instance, we wish to ascertain the volume of a silver-tin-copper alloy, each metal to be used in the alloy must be first brought to its full melting-heat, being protected during this operation from oxidation or other chemical changes, then allowed to cool down slowly to room temperature. Sections are carefully made from the ingots, and their specific weight is ascertained. This is done by weighing a section in air, then in water at 4°C., then subtracting the weight in water from the weight in air. The weight in air is then divided by the difference, and the quotient represents the specific weight, this being the ratio of the weight of the section to that of the water which it displaces. Thus, if a solid object has an actual weight in air of 10 grams, and its weight in water is 4 grams, the difference is 6 grams; and 10 divided by 6 equals 1.666+, or the specific weight of the object. Water at 4°C. is recognized as the unit of volume for substances heavier than itself, and as unity is 1 it is obvious that 1 divided by the specific weight must equal the specific volume; therefore we divide 1 by the specific weight which we have ascertained for each metal, and so obtain its specific volume. We are now ready to proceed with the volume determinations for an alloy of the metals used in the experiments. We melt them together in such ratios as required, and when they are thoroughly diffused, that is in perfect distribution, having been protected from oxidation, the alloy is allowed to cool slowly to room temperature. The ingot should not exceed two grams in weight. We now determine the specific weight and specific volume of the entire ingot, in order that the factors of error may be reduced to a minimum. The ingot is now analyzed. The ascertained specific volume of each metal we multiply by the percentage in which it is present in the alloy, add the results, and divide by 100. This gives us the ideal specific volume, which, compared with the actual volume that has been determined for the alloy, shows whether the alloy has expanded or condensed or is in volume equilibrium. There are factors of error in the weighing and analyzing, and slight differences in the rate of cooling, but these should not exceed two or three hundredths of one per cent. if the work has been carefully conducted, and may be disregarded for practical purposes.

What is termed shrinkage and expansion in an amalgam filling are phenomena of a quite different order from the volume changes that take place in the actual alloying of metals. The amalgam filling is never in the perfectly melted

state that is necessary to insure correctness of the determination of its specific volume. So we must look to its constitution and to thermal, mechanical, and manipulative treatment which it has undergone, in order to get a clear understanding of its volume changes.

As to physical constitution, amalgam alloys may be divided into two classes, those which contain a large percentage of tin, recognized by their characteristics of rapid amalgamation, great plasticity, and slow crystallization; and those which have a small percentage of tin, which have directly the opposite characteristics, that is, slow amalgamation, reduced plasticity, and rapid crystallization. The first class contains alloys that appeal to those who wish their amalgams to "work easily." This desire is an error which has resulted in the loss of a countless number of teeth which might otherwise have been saved; for such alloys, after amalgamation, change form in such a manner that the fillings draw away from the edges of the cavity walls, this phenomenon often being referred to as "shrinkage" or "contraction," whereas, as a matter of fact, the filling may have actually undergone an increase over its ideal specific volume. This drawing away of the filling is due to the fluidity of such soft alloys, and the tendency of a fluid body to assume a spheroidal form. It is not true volume change, but rests in the physical constitution of the amalgams in which it occurs. In them there is first a chemical reaction between part of the Hg and all of the Ag_3Sn constituent, then the remainder of the Hg forms a solid solution with the excess Sn which, as a soft matrix, envelops the chemical crystals. It is the softness and low melting-point of this matrix of HgSn that permits the operation of the law which governs the shape of fluid or partly fluid masses.

In the alloys of low tin content we encounter apparently contradictory properties, for with a given formula we may in an amalgam filling have either shrinkage or expansion, or shrinkage followed by expansion. In the case of shrinkage or expansion of the amalgam, we have to deal not only with constitution, but also with thermal considerations as well as manipulative processes. Thus, if such an alloy, thoroughly melted, is cast into a very cold ingot mold, it suffers a correspondingly rapid loss of thermal energy, and will be found to be in a state of condensation, and if this ingot be slowly reduced, by means of filing or turning, to fine powder or shavings, the ingot and the cutting tool being frequently chilled during the operation, the filings or turnings will still be almost in the same state of condensation as was the ingot from which they were obtained. As this condensation is really a state of strain, which must be relieved before there can be a return to normal volume, we may expect an alloy in this state to return to its normal volume when amalgamated. Thus we have the phenomenon of excessive expansion of the filling, due to the release of the strain of condensation.

Such a strain is relieved by annealing, termed "aging," or automatically in the course of time. Conversely, had the melted alloy been cast into a hot ingot mold, then allowed to cool slowly, after that being cut down without cooling the ingot or cutting tools, this being followed by annealing the cuttings over too long a period of time or at too high a temperature, the alloy would be in an over-relaxed state, and, in crystallizing after amalgamation, it would shrink, but not necessarily "condense" in the scientific meaning of the word as regards the ideal volume of its components. In the case of an alloy which both shrinks and expands, we have to do with both thermal treatment and chemical constitution, for if an alloy has not been thoroughly melted there will be crystals of free metals which must, by slow diffusion of the mercury, be brought into a state of comparative solution before the amalgam can be in a state of rest. During this operation the filling may, through internal motion, change its form, *i.e.* first draw away from parts of the cavity walls and then expand. Manipulation has an important bearing on these properties in an alloy

which both shrinks and expands, for if through errors in manufacturing processes it shows a tendency toward excessive expansion, it may in part be controlled by thorough trituration with an excess of mercury, the release of the strain of condensation taking place during the operation of mulling, through the solvent action of the mercury and the mechanical disintegration of the crystal. On the other hand, if errors of manufacture have resulted in shrinkage, it may in part be controlled by employing less mercury, less trituration, and then strongly compressing the amalgam when it is introduced into the tooth cavity.

In this connection, it should be strongly emphasized that "shrinkage" may develop as a result of the over-trituration of any amalgam alloy, it matters not how scientifically it may have been originally adjusted to a correct expansion point, for, as has been shown, the condensation of an alloy may thus be over-relaxed, and consequently produce bad margins and leaky fillings. This error must therefore be carefully guarded against.

THE EFFECT OF CORROSION UPON CHANGE OF FORM.

When speaking of "corrosion" it was shown that zinc is soluble in amalgam fillings under the conditions by which it is surrounded in the mouth. Such a solution gives rise to new combinations of the zinc with other elements that are present in the saliva. These combinations are obviously of greater volume than the metal which forms their base; for each element, whether it be sulfur, chlorin, or oxygen, has its individual volume, which cannot be destroyed. This volume is added to the volume of the zinc which forms the base of any of the combinations. This naturally results in an increase in the bulk of the filling—that is, its "bulging" from the cavity. As this corrosion of zinc progresses in the amalgam filling, the other metals are taken up in the order of their solubility and in the same manner, until the filling has been fairly forced out of the tooth cavity by the accumulation of the by-products of solution and re-combination. This may be looked for in amalgam fillings which contain zinc, whether the tin content of the alloy be high or low, in proportion to the ratio in which the zinc is present.

SOLUTION.

In the melting of an alloy it is highly important that its metals should be brought into a state of complete solution in order that the alloy may be homogeneous. The possibility of such a state depends, first, upon the mutual solubility of the metals that are used, then upon factors of temperature, time, and diffusion. This latter function depends upon osmotic pressure, defined as the driving force in solutions. (See Walker's "Introduction to Physical Chemistry," 3d ed., page 171.) It produces molecular movement in solids, liquids and gases and so causes the intimate admixture of substances that are mutually soluble. Diffusion progresses in alloys at quite low temperatures, even though the alloys are in the solid state. This is demonstrated by Roberts-Austen's famous experiment with superimposed cubes of gold and lead, in which the gold rose by diffusion, against gravity, quite to the top of the upper cube of lead. The cubes, in perfect contact, had been maintained at a temperature of about 18°C. for four years, after which analyses were made of successive cross sections of the lead taken from the top to the bottom of the lead cube, and the ratio of diffusion of the gold into the lead was thus established. Desch gives instances of diffusion in solids, and illustrates with photo-micrographs the diffusion of zinc into copper.

In order that diffusion may be thorough, in an alloy for dental amalgams, it will be seen that the operation of melting an amalgam alloy must be properly conducted, or the product will be impaired. The alloy must be of correct formula in order that the affinities of the various metals shall be such that they are chemically soluble in each other.

They must be melted together at the correct temperatures and over a sufficient period of time, during which the melted alloy must be protected from oxidation (or other chemical changes) so that by-products of combustion shall not mechanically interfere with the progress of diffusion.

Diffusion operates at mouth temperature, so that a seemingly inert amalgam filling may nevertheless be in a state of slow internal motion, this being particularly true of fillings made from heterogeneous alloys.

Conclusions.

We have considered the matter of dental amalgam alloys, first, from the standpoint of the metals that have been established as those best suited for the purpose of dental investigators as well as by the dentist himself; second, the physical properties demanded as the requirements of such alloys; third, the structure and constitution of dental amalgam alloys as determined by the methods of metallography; fourth, the phenomena that develop incidentally to their use as amalgams; fifth, the effects of errors in manufacturing processes and manipulation; and it now seems timely to consider the relationship of all of these factors to the problem of how best to utilize the metals silver, tin, and copper in the production of a satisfactory amalgam alloy for dental use. Thus we shall follow, as best we can, the aim postulated by Roberts-Austen, that of applying the results of our studies to the development of "the relation existing between these ascertained factors and their useful properties."

Several facts have developed, the first of which is that in order to secure the property of expansion when it is amalgamated, we must produce an alloy of condensed volume. This condensation must be accentuated by quenching in a cold ingot mold during the casting of the melted alloy, and the filings made from the ingot must be tempered by annealing in order that the subsequent expansion of the amalgam shall not be in excess of the requirements. Heterogeneous alloys, being in their nature conglomerates, we may expect to fail in respect to this requirement, and eutectics are also to be rejected—for they, as a rule, expand in cooling. Chemical compounds, then, by reason of their close organization and the consequent condensation in cooling and the fact that they are, if correctly melted, homogeneous, are the alloys best adapted for the development of this property.

The requirement of prompt "setting" is best met by a chemical compound of metals, for chemical reactions are invariably more rapid and certain than those of merely physical combination.

The requirements of rigidity and strength are best met by a chemical compound—for such compounds, as a rule, are harder than any of their constituents, and they possess greater compressive strength, the latter property being of the highest importance in an amalgam filling. The requirement of resistance to corrosion is best met by a chemical compound of metals, for, as has been shown, such compounds are more resistant to electrolytic decomposition than are either solid solutions, eutectics, or heterogeneous alloys.

The quality of uniformity—that is, the continuous reproduction of given properties—is best met by a chemical compound of metals, for, as a result of the fixed proportions of their components, their properties are constant.

THE PROBLEM OF DENTAL EDUCATION.

By EUGENE S. TALBOT, M.S., D.D.S., M.D., LL.D., Chicago, Ill.

THE dental schools of this country up to the present time have been passing through a period of incubation which has extended from the earliest beginnings of the filling and extraction of teeth, as well as the inserting of artificial substitutes. The technique was purely mechanical and confined entirely to the teeth, whereas the general welfare of the patient was not considered, except so far as mastication is concerned. Even as late as 1839, when the first dental school was established, the earmarks of what constituted dentistry then were set forth in no unmistakable terms by conferring upon graduates the degree of Doctor of Dental Surgery, which expressed in exact terms what constituted dentistry to the recipient and to the community. The graduate was thenceforth considered qualified to treat the teeth. This badge of qualification to practice is still in existence, and is granted or issued not only by dental departments of universities, but by the schools owned by private individuals. It is true that dental schools have always had chairs on anatomy, physiology, chemistry, histology, bacteriology, etc., and that in some of them the students are taught these subjects by the same teachers and in the same classes with medical students. The active tendency, even at the present time, in all the schools, unlike those abroad, is to concentrate the energy of the student on the study of the mechanics of dentistry rather than on the general welfare of the patient, as is shown by the fact that during the major part of the term the mind of the student is centered on the clinic and laboratory. It is also true that the university will not give credit toward a medical course in the general branches of medicine already taken by the student and passed upon by the chairs. Nowhere in this country can the graduate of dental surgery obtain credit in any medical school for his three or possibly four years of study. This demonstrates clearly that his dental course of study has been superficial, so far as medical branches are concerned. It is a foregone conclusion that the graduate of dentistry is not prepared to, nor is it intended that he should understand the diseases of the body in their relation to the teeth, much less treat them. The teachers have shaped the course of studies in the dental schools and have placed the standard of requirements purely on a basis of the mechanics of dentistry, in accordance with the nature of the degree to be conferred.

REQUIREMENTS FOR ADMISSION.

Although the students are required by most dental schools to possess a high-school certificate or its equivalent for admission, many of them fall far short of the standard of a four years' high-school education. The student, therefore, after a three years' course, is found not up to the professional standard he should be when he enters practice. The result is that those who practice dentistry do not possess the standing that is exacted of those practicing the other specialties of medicine.

Whenever the subject of dental education has been discussed in our societies, the teachers have always offered the same excuses which have been handed down for many years, and have become *ad nauseam* to the older members of the profession. Since my

articles on "Swan Songs"* were published a few years ago, the older excuses for the want of advancement of dental education have been to a certain extent abandoned. Three new "swan songs" have lately been introduced as excuses for not increasing the number of years of study for dental students. One is that there are too few dentists to supply the demand; hence it is natural to suppose that the students must be rushed through the dental college mills as cheaply and quickly as possible to supply the demand. It is not necessary to comment further on this phase of the subject at this time.

Another excuse is that the state board laws are such that they do not require or demand a higher standard for practice, and that these laws must be changed before any advancement can be made in the dental schools. In reply to this excuse, I have only to refer the teachers to what has been and is being accomplished in the practice of medicine in this country in the past few years.

MEDICAL COLLEGES AND STATE LICENSING BOARDS.

Ten years ago there were 166 medical schools in this country, while now there are only 101. Of this number this fall, 37 for the first time are requiring for admission one year of collegiate work, in addition to a four years' high school education; add to this number 47 which had already adopted this standard, making in all 84 colleges. Only 22 of the 49 state licensing boards require this standard. In addition to this, 34 of the 84 colleges and 7 of the state licensing boards have gone farther, and adopted the requirement of two years of collegiate work as the minimum preliminary standard. Many of the state medical licensing boards, like that of Illinois for an illustration, require only a high-school certificate as a minimum for entering a medical school, and yet there are three schools in Chicago that require two years' academic training, six or eight others requiring one year. And there are other schools which require as a minimum amount, only a high-school certificate for entrance. The same pertains to other states. It will be seen, therefore, that the state medical licensing boards have had very little, if anything, to do in formulating and fixing the standard of medical education. It will be observed that the state boards have not all kept pace with the requirements of advanced medical education. The medical schools, however, are still raising their standard in advance of state licensing board requirements. Since both the medical and dental schools always have and probably always will set the standard for teaching, the state licensing board will be obliged to conform to the dental curriculum, just as the medical boards have conformed to the medical curriculum. The tendency is to blame the dental profession for the standards of the dental colleges and the state boards. The teachers forget that they regulate the school educational standards for the dental profession, and most dentists, when they graduate, are contented to abide by those standards. While most of the members of the state boards of dental examiners possess the ability of the average general practitioners, many of them are far below that standard, since they are unable to prepare lists of questions for their yearly examinations, and are obliged to go to the college teachers for instruction and assistance along this line. Can water rise higher than its source? Who, then, is to raise the standards of the state boards? Let the teachers educate the students to the standard required by the public, for which they have been paid; then the profession will bring the state laws up to that standard. The teachers who are continually offering excuses for their shortcomings are not calculated to make a success in life. If the dental schools would raise their standards, the state boards would soon follow, just as is being done by the medical licensing boards.

* See DENTAL COSMOS, March 1908, vol. l, p. 232.

The third excuse is that if dentists be graduated in medicine, they will practice medicine rather than dentistry. The excuse is not tenable, from the fact that the medical profession is now greatly overcrowded.

From an editorial, "No Danger of a Scarcity of Physicians,"* I quote: "The normal proportion of physicians to the population in the leading nations of Europe is one to every 1500 to 2500 people; this country has one physician to every 600 to 650. The figures given for this country do not include the osteopaths, Eddyites, and other so-called drugless practitioners, which are scarcely found in other countries. The annual loss of physicians by death in this country is approximately 2000, while the annual report of physicians from medical colleges for several years exceeded 5000."

It requires at the present time an exceptionally well-educated man to compete with those engaged in active medical practice. If, therefore, a student who has been graduated in dentistry thinks he can achieve greater success in the practice of medicine, he should be encouraged to do so. The outlook for the stomatologists is brighter, however, since the field is larger, and quicker remunerative returns are assured.

STANDING OF THE DENTIST.

The standing of the dentist and the dental profession depends upon the product of the dental schools. The dental teachers specify what the standing of those who enter shall be, and supervise the instruction for the finished product. If the medical colleges and the state boards are a criterion to go by, it behooves the dental college faculties to get busy, and advance their standards along lines of one or two years' more study. Shall the extra year be added to the dental course, or shall it be a year of academic training? There are some teachers who believe that one year of academic training along the lines of a preliminary medical school curriculum, together with a four years' high-school course, would place the student on an equal footing with the medical student; that it would save much time in the dental course. The student would be better prepared to take up and understand medicine and dental subjects. Much of the preliminary work in the dental schools could be dispensed with.

Other teachers would prefer to add a year to the regular dental course, since it would increase the income of the school. How it is possible to fill in another year teaching dentistry is a problem to the author. At the present time, in some of the schools, the students are sitting about doing nothing a considerable part of the day. Much time could be saved by eliminating unnecessary lectures. By keeping the students busy every hour in the day, and reconstructing the lecture course, much time could be conserved for better purposes. After foundation principles have been taught, I know of no specialty in medicine that cannot be acquired by the student in two years' time.

DENTISTRY AND DISEASE.

Lately it has dawned upon some members of the dental profession that certain pathological conditions of the teeth play an important rôle in producing diseases of the human body, and that a knowledge of general medicine is necessary to practice dentistry successfully. It is only within the past few years that physicians, like Billings and Rosenow, have actually demonstrated a part of this relationship. Dr. Charles H. Mayo asks, "What will the dentists do about it?" A certain number of the dental profession realized this connection between diseases of the mouth and diseases of the body. There are still a certain number of teachers who do not or will not believe that this relationship exists; they maintain that the teeth are like so much cord-wood, to be cut and sawed without the least regard for the patient's welfare. This statement is evidenced

* *Journal of the American Medical Association*, August 22, 1914, p. 692.

by the fact that they advocate adding a fourth year to the dental course, which, in reality, would narrow rather than broaden the scope of the student. The fact still remains that there is a field between medicine and dentistry which can only be filled by broad, medically educated men. They are the men who will be the successful practitioners of the future. The men who have already grasped the situation and are working in harmony with the general practitioners of medicine are those dentists who are medically educated. That there is a demand for a larger number of dentists is true, but they should be able to grasp any situation, and be equal to any emergency that may arise in relation to general diseases and mouth lesions. Hardly a day passes but that the better educated men, in our large cities, receive patients from different parts of the country suffering from complications that are not understood by the average dentist.

The period of incubation in our schools has now passed, and we are in the dawn of a future higher development. The question has already been asked, Will the profession rise to the situation? That will depend upon the influence brought to bear upon teachers to so reconstruct their methods of teaching that the future graduate will be competent to take up the work and carry it forward to a higher development. We have passed the line marked out sixty-five years ago as dental surgery, and have entered the field of stomatology. If we are to be successful in the practice of this branch of the healing art in the future, students must have a thorough preliminary training before they enter the dental school, and also a general medical education before they are graduated. We have come to realize that our specialty is as intimately connected with the welfare of the human body as are other specialties of medicine. Why, then, should we not strive to make as rapid progress in the advancement of teaching as the medical schools?

TWO CAMPS IN THE FIELD.

At the present time, the profession is divided into two camps. One advocates that the degree of D.D.S. is all-sufficient for practice, while the other contends that the M.D. degree is necessary. The author, as is well known, has devoted his energies to the latter camp-followers for the last forty years. He has watched the progress of both medicine and dentistry from year to year. His associations with medical colleges and societies have brought him in intimate relations with the progress of medicine as well as dentistry. He has always been a strong advocate of a thorough medical education for the practice of our specialty, and believes that those who can pursue the regular course of medicine in connection with dentistry will feel more than repaid for the extra time and money spent. Such men will have the respect and influence of the medical profession. The time has arrived when physicians must consult with the dental practitioner, as has already occurred in the larger cities. Physicians are seeking in their consultation work the aid of those specialists who are medically educated graduates.

There is, however, a class of teachers and practitioners who are satisfied with the dental degree. There is no question but that there are plenty of teeth to be doctored. The mechanics of dentistry have always been required and always will be. How, then, can the courses of study be arranged so that the granting of both degrees may be made possible, harmonizing all the difficulties mentioned (and many others not mentioned), and wasting no time or money in the effort?

A RATIONAL SCHEME FOR THE PROBLEM OF DENTAL EDUCATION.

Both medical and dental schools now require the candidate to be a graduate of an accredited high school, or to possess a certificate from the state superintendent of public instruction showing that the applicant has an education

equal to that obtained in an accredited high school. The candidate should now enter the university or college for at least one year. In this year the student should take up biology, physics, chemistry, and modern languages. The same studies are required of the medical student. He is now prepared to enter the medical or the dental department, as the case may be. All dental schools should be actual departments of universities, preferably state universities. The first year should be devoted to the fundamental branches of medicine, and due credit should be given for the same toward a future medical course. The student may now enter the dental school for two years and graduate with the degree of D.D.S. If he is desirous of continuing his studies in medicine and to become a stomatologist, he may now enter the medical school and finish his studies in this department, obtaining the M.D. degree. The course may be reversed; he may enter the medical school, graduate, and finish with the dental course.

In a general way, I have mapped out a course which covers most if not all of the objections, and which may easily be acquired. The details can be worked out by the dental faculties to conform to individual cases. By the first method the graduate of dentistry will be on equal footing with the medical graduate, so far as he has progressed, and the stomatologist has lost no time or money in acquiring the knowledge and position he is so desirous to obtain. The dentist, on the other hand, is so situated that, should he change his mind and desire to continue his studies and become a medical graduate, the time and money spent in the dental school have not been lost.

Such rapid progress has been made in the past few years in the medical schools, and so little has been accomplished in the dental schools, that the contrast is appalling. Let me inform the teachers that there is no way to shift the responsibility for a more complete education of the students. They matriculate in our colleges, and are utterly innocent as to what is required of them as practitioners. The standing of our specialty in the community, as a whole, practitioners, or members of state licensing boards, as well as our state laws, depends entirely upon the qualifications of our graduates. Let us hope that the teachers will cease formulating childish excuses, and instead get together, and all agree on some course of procedure which will eliminate all the incongruities of the past and place our speciality in the line of progress on a par with that of the medical profession.

THE RECOGNITION OF SYSTEMIC DISTURBANCE IN THE TREATMENT OF ORAL LESIONS.

By B. H. TEAGUE, D.D.S., Aiken, S. C.

(Read before the South Carolina State Dental Society, at its annual meeting, Greenville, S. C., June 17, 1914.)

"THE practice of dentistry is the exercise of dental art, and embraces all that pertains to the knowledge, prevention, and cure of the diseases which the dentist is called on to treat"—to paraphrase the introductory assertion of the author of a medical work. "Disease may be defined as any departure from the normal standards of structure or function of an organ or tissue, or both combined." (Hughes.)

The diseases that dentists are called

on to treat are oral lesions, and are generally of toxic origin, either local or systemic, and the treatment given them is usually solely topical. Nature, in great part through *vis vitæ* and patience, accomplishes a cure, when adjuvant systemic treatment would have accelerated her strenuous efforts toward that end.

ALVEOLAR ABSCESS: ADJUVANT SYSTEMIC TREATMENT.

Alveolar abscess, the most frequent of the oral lesions that require attention, in its incipient stage—viz, that of peridental inflammation—is most readily aborted by opening the septically surcharged tooth which is the focus, irrigating it with a germicidal wash, cleansing it of bacterial matter, and filling the roots and crown with antiseptic material, either temporarily or permanently as the case demands, and then by applying counter-irritants to the adjacent gums. If the patient's system, however, is in a bilious condition, the heroic method of surgical perforation of the alveolar plate, reaching the inflamed point, and bloodletting, is absolutely necessary for quick relief. This systemic condition should always be diagnosed, and when it is confirmed, the patient should be put upon a course of systemic medication conjointly with the topical treatment. If neurasthenia exists, and the patient's vital force is low, it will be found that the case will not readily yield to alleviatory measures. The general nervous system then should be attended to and toned up. A cure is especially difficult when the patient is affected with disease of the kidneys. In chronic diabetes, particularly, the family physician should be called to consult with the dentist. In this dyscrasia the capillaries are sluggish and inert in disposing of the effete blood at the focal point; congestion takes place, and pus rapidly forms. The system is so charged with toxins uneliminated by the weakened kidneys that the offending tooth acts as "a splinter in the flesh," and in spite of all remedial efforts, extraction in the majority of instances is to be resorted to, to prevent toxemia.

OTHER ORAL CONDITIONS REQUIRING PRELIMINARY SYSTEMIC TREATMENT.

It is in this condition of dyscrasia that a blind abscess evolves into the active stage. In this condition, moreover, local as well as reflex neuralgia occurs, severely at times, in the treatment of septic roots of teeth, in the extraction of semi-devitalized pulps from tooth-roots, and in the insertion of pivot teeth. The slightest impingement on or disturbance of the end of the connecting nerve to a tooth, or those in the tissues adjacent to the end of the root, is sufficient to cause nervous derangement. This condition of the system should be recognized in the treatment of such forms of stomatitis as the aphthous, catarrhal (salivation), gangrenous (cancrum oris), and ulcerative; particularly in pyorrhea alveolaris, hypertrophy of the gums, inflammation from the eruption of third molars, and irritation of the mucous membrane under artificial dentures; when hemophilia is suspected, when the gums are to be lanced or excised, and teeth are to be extracted. An alterative and tonic systemic course of treatment is here indicated before operations are performed, and a sedative course should be given in cases of excessive nervousness prior to sittings for the excavation of sensitive dentin, since it will be found that topical applications of anesthetics for the prevention of sensitiveness will be more effective, and the patient will also submit to strain better when previously prepared for it.

SYPHILIS.

That terrible, blighting scourge of humanity, syphilis, should be reckoned with more appreciatively by dentists than is generally the case. The symptoms of its three stages should be known, especially those of its secondary manifestation, for in this stage the danger of infection is greatest to the operator, and through him to his patients. The

markedly pitted and ill-shaped teeth of inherited syphilis are generally well known. In the treatment of pyorrhea alveolaris, systemic disorders must be considered most carefully. Dr. Baldwin and Dr. Larned in their brochure, "Syphilis in Dentistry," have this to say: "It was then that a more careful examination of the teeth of syphilitics was entered into, and the result was the finding of a comparatively large number of cases of pyorrhea alveolaris. Upon request, a number of dentists submitted cases. These were carefully questioned, and about two-thirds gave a history of syphilis. A sufficient number existed to classify them as cases of syphilis *ignorée*, or as old cases of tertiary syphilis in which there was only the bone symptom to be observed. However this may be, the subsequent treatment showed that the etiology had been correctly established." "The few observations made have shown a greater or lesser interdependence between syphilis and pyorrhea alveolaris."

SYSTEMIC DISEASES ASSOCIATED WITH PYORRHEA ALVEOLARIS.

"Is it not a curious coincidence that Riggs' disease should be observed in so many cases of secondary syphilis as well as the late form of this period? It must also be remarked that pyorrhea alveolaris occurs as a parasyphilitic phenomenon. When we take into consideration that the teeth are observed to be sound before syphilitic infection, and that after the disease has manifested itself it shows its presence; and, further, when systemic as well as local treatment directed to the syphilis causes both to disappear, we are justified in concluding that lues is a factor in the production of Riggs' disease."

Other dyscrasias must be thought of in the treatment of this malady. Tuberculosis, malaria, fevers, liver trouble, diabetes, gout, and rheumatism are to be considered as potent basic factors in the stubborn resistance to cure in spite of skilful instrumentation and intelligent application of topical medicaments.

Without doubt, many of the failures of successful treatment of pyorrhea alveolaris, assiduously attended to locally, are caused by neglect of the consideration of systemic conditions.

Hypertrophy of gum tissue, at times almost overreaching the grinding surfaces of the teeth in its severity, is best treated by diagnosing the etiology of the disorder, and employing such general therapy as will accelerate the topical.

Irritation and inflammation are the characteristics of oral lesions that dentists have to treat, and in the main are reflexes and local manifestations of general systemic disturbances. In the practice of orthodontia it is well to recognize the importance of keeping the general system in such healthy condition as to preclude nervous strain and shock. The same is to be said in the treatment of traumatic injuries of the jaws, fractures of the mandible, etc.

A PLEA FOR SYSTEMIC MEDICATION.

It may be argued that the busy dentist cannot undertake the systemic treatment of his patients, and especially in chronic cases. This may be true as far as the majority of the profession is concerned, but to those who practice according to the full scientific light of the calling it is only true in part. The dentist should be familiar with pathological conditions of the general system, and know when to advise general medical treatment to his patients, at the hands of the physician, when he is confronted with a severe local lesion of a deranged system which is stubborn to cure. His should be the province to prescribe for simple derangements of the system such as biliousness, nervousness, and other temporary ailments.

We plead for more scientific study along these lines, and though we would not seek to minimize the artistic and technical phase in the practice of dentistry, yet dentistry being the connecting link between medicine and mechanics, this link should be made strong and perfect in all its parts.

PROCEEDINGS OF SOCIETIES.

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

Regular Monthly Meeting, held December 22, 1914.

THE regular monthly meeting of the Academy of Stomatology was held at the Aldine Hotel, Philadelphia, Tuesday evening, December 22d, at 8 P.M., Dr. J. V. Mershon in the chair.

The first order of business was the reading of the minutes of the previous meeting, which were approved as read.

The Council reported the following officers elected for the ensuing year:

President—Dr. J. C. Curry.
Vice-president—Dr. A. P. Lee.
Secretary—Dr. Dudley Guilford.
Treasurer—Dr. A. E. Bassett.
Member of Council—Dr. J. C. Salvas.

Dr. Curry was duly installed as the new president, and presided during the evening.

INCIDENTS OF OFFICE PRACTICE.

The next order of business as announced by the Chair was the reading of the following five-minute papers on incidents of office practice, which were discussed together:

Intermittent Pain in the Superior Dental Nerve Due to Obscure Dental Causes.

By Dr. J. CLARENCE SALVAS, Philadelphia.

The following case is reported for two reasons: First, because in the experience of the general practitioner it is rare, and second, because it is a forcible reminder of the responsibility of the dentist, impressing upon us not only the importance of following up every possible clue that may lead to the determination of the cause of obscure troubles, but also the necessity of being familiar with all conditions wherein this cause may exist. By reason of the fact that we work in a comparatively small field, and are thoroughly familiar with the causes and symptoms as expressed in pathologic conditions, we are apt to work more or less perfunctorily. Our diagnoses are necessarily made quickly, in fact, frequently before an examination is made. Pulpitis, for instance, will cause pain which has certain characteristics differentiating it from periapical disturbances. When a patient comes to us suffering with neuralgia or pain in the face, we look for some one of the familiar conditions with which we are meeting daily, but when there are none of these conditions to which we can attribute the trouble, we generally pass the case on to the physician. This had been done by two practitioners in the case under discussion. The patient was a sort of football between the physician and the dentist. The dentist being unable to locate the trouble, she was turned over to the physician, who, as he said, exhausted the pharmacopeia in treating her for everything from facial neuralgia to tic douloureux. The patient was then sent back to the dentist, but without any results. Her husband, being a physician of intelligence, felt that he had exhausted every possible means excepting a surgical operation for relieving his wife of the agony she was suffering, and it was with reluctance that he consulted a surgeon. The surgeon urged a consultation of

dentists and advised that if they could not locate the trouble the patient should have alcoholic injections; if these failed, an operation was to be performed. This, in short, is the history of the case up to the time when it came into my hands.

The patient, fifty-three years of age, in good health, had been suffering for from three to four weeks from pain in the upper right side of the face. The pain was intermittent, appearing sometimes in the mornings, sometimes in the afternoon, and frequently at night. The teeth had been well cared for. On the right side, the first and second molars and the second bicuspid were present; the first bicuspid had been extracted, also the third molar. She was wearing a small gold plate. With the exception of a pyorrheal pocket, the canine was in good condition. The second bicuspid was perfect. The first molar had a small gold filling in the buccal surface, and the second molar a cast gold filling. These fillings were removed to note the condition of the pulp, and a thorough examination was made of the adjacent teeth. Finding nothing of a pathologic nature, I ordered an X-ray to be taken. This was done at once, and the operator reported the sinuses clear and no indications of any trouble about the roots of the teeth. When the husband of the patient brought the X-ray plate to me, I found that, from the dental point of view, it was not clear enough, and urged him to have another exposure made. He consulted Dr. Pfaehler, who reported, after the plate was finished, that it disclosed nothing that would indicate a pathologic condition. I found on examining this plate that the root of the bicuspid had penetrated the antrum, though there was nothing that would indicate any trouble. My working on this tooth seemed to have a psychic effect, as the next morning the patient appeared with her husband saying the trouble had localized in the tooth, and that the pain during the night was in that tooth and not in the face where it had been. After careful consideration I removed the pulp under pressure anesthesia, leaving a dressing of camphophénique in the canal. The following morning the patient's husband called me up and said that his wife had spent the most comfortable night she had had for several weeks, being absolutely free from pain. I felt certain, however, that the relief was but temporary, as the pulp of the tooth had been normal. I sent the X-ray plate to two other experts in the reading of radiographs, but they reported nothing wrong. In the evening of the fourth day following the removal of the pulp, the patient had a return of the pain, which during the night became more severe and more intense than ever. The husband was now determined to discontinue the dental treatment, and try alcoholic injections, but I persuaded him to consult Dr. Cryer first. Dr. Cryer made a careful examination, secured another radiograph, and decided after studying it that the trouble was due to the roots of the molar and bicuspid impinging on the superior dental nerve. He advised the immediate extraction of the two teeth, and subsequent to this operation the trouble disappeared definitely.

A Method for Preventing Caries in Children's Teeth.

By Dr. E. Carlton Palmer, Philadelphia.

The method to be described may have been used by many practitioners before, but it may offer to others a way for the satisfactory solution of what has heretofore proved a vexatious problem.

Initial caries in first and second molars and bicuspids, which often appears almost as soon as these teeth begin to erupt, seems almost impossible to prevent without cutting out the groove or grooves and inserting some filling, but this procedure has always seemed unsatisfactory to me.

In caring for the teeth of my daughter, who is twelve years of age, I observed the well-known deep sulci, especially in the first and second molars, where the enamel has failed to unite completely, leaving defects which it is impossible to keep clean by everyday oral hygiene. Despite a careful clean-

ing on my part, I was afraid that there still remained caries-producing material in these sulci, and I was driven to seek some remedy to prevent the formation of cavities.

When the teeth first appear through the gum, the rubber dam is applied and the tooth isolated, washed thoroughly with an alcoholic solution of iodin and polished with a stick and pumice and with stiff brush wheels in the engine handpiece. Then the tooth is washed carefully with 95 per cent. alcohol and dried carefully.. With the finest explorers, as much of the foreign material as possible is picked and scraped out of the sulci, using an excavator only where absolutely necessary, the reason being that we do not wish to cut the surface of the enamel if it can be avoided. It is surprising how many teeth, after having been washed, cleaned, and dried in this way, show well-defined cavities that need the regular cavity preparation and filling.

After all the fine grooves and pits have been cleansed mechanically, they are washed with a 1:1000 solution mercury bichlorid, dried, and washed again with alcohol, and again dried finally. *Black* copper cement is then mixed to the same consistence as for setting a crown or bridge, and smeared all over the crown of the tooth, filling all the depressions. With fine explorer points this cement is worked into the pits and sulci; then, while the cement is still soft a piece of unvulcanized rubber of about the size of a small marble is placed over the cement, and with a finger is pressed hard to the tooth and held there until the material is quite hard enough not to be disturbed when the pressure is released. Plenty of time is allowed for the cement to become well set before it is trimmed. When the material is well hardened, the excess is carefully scraped and burred from the surface so that it will in no way interfere with mastication, else there will be danger of drawing the cement out of the grooves when it breaks off, which it will do in a few days, leaving a hairlike line of the black material, which penetrates to the very bottom of the defect, and presents such a small surface to the action of the saliva that it washes out very slowly.

I have tried other cements, at various times, but nothing seems to give as good results as black copper cement. Its extreme stickiness renders it specially suitable in these cases, its objectionable color being not nearly so much of a blemish as one would at first suppose. Furthermore, owing to the great contrast between the color of the tooth and that of the cement, the coming-out of any part of the material is at once detected.

Since this treatment of my daughter's teeth I have found no indications of caries, the cement holding perfectly. Her teeth have been treated in this way now for a period of three years. I have also been following this method in other children's mouths with equally satisfactory results.

Advisability of the Use of Vaccines in the Treatment of Pyorrhea.

By Dr. W. Sterling Hewitt, Philadelphia.

About two years ago I became convinced that the treatment of pyorrhea by the use of a vaccine was a scientific and practical method. I have now treated a sufficient number of cases to be able to report to this society upon its success and failure, and the probable cause of either. I started with the assumption that all cases of pyorrhea were the result of infection by various forms of bacteria, and therefore curable by means of a vaccine or bacterin. The first few cases I undertook were so successful that I was dazzled, and saw a sudden end to our greatest difficulty.

I then undertook the treatment of a case which apparently presented the same conditions as the preceding ones, and failed hopelessly, even aggravating the symptoms. This caused me much embarrassment, for I had promised too much. Since that time I have had successes and failures, either curing absolutely or failing miserably. I will say in passing that all cases were preceded by careful local treatment, using the

bacterin only as a last resort. These results are most remarkable when we consider recent announcements and discoveries as to the cause and cure of pyorrhea. If all cases are caused by an amœba, how came I to cure any one case with bacterins? If all cases are caused by bacteria, why did I not cure all with autogenous vaccines or bacterins? If all cases are caused by constitutional conditions, how can any case be cured by any method directed toward local conditions?

In view of the above, I am convinced that so-called pyorrhea, instead of being one disease, is a group of diseases having a similar final result. By even the most casual examination of a number of cases, differences of the most marked character will be observed. I am afraid that we are as unscientific as the ophthalmologist would be, if he looked upon all diseases causing blindness as one disease and treated them accordingly.

We should cease trying to find one great and only cure, and direct our energies toward isolating and classifying these different lesions, and assigning to each its appropriate treatment. Until we do this I am afraid we can regard ourselves as little better than charlatans. I therefore advocate the use of an autogenous vaccine most heartily when it can be proved that bacteria are the actual cause of the disease. In those cases where some of the protozoa, or constitutional conditions, are proved to be the primal cause and the bacteria are only associated, a vaccine is manifestly useless.

Repair of Split Roots: A Case of Replantation.

By Dr. H. E. Roberts, Philadelphia.

On July 13, 1907, a gentleman split his upper first bicuspid, which had prominent cusps, deep sulci, and contained a large filling in the occlusal surface. The tooth was ligated with seagrass, which was allowed to shrink so as to render it very tight and firm. A hole was drilled through the tooth from the buccal to the lingual surface. A piece of platinized gold wire of No. 18 gage was threaded at one end, the measure of the width of the tooth taken, and the other end of the wire headed. The hole through the tooth was countersunk on both sides, and the inside of the hole through the tooth was slightly roughened. The wire was then placed in the tooth, and cement worked into the thread and allowed to harden. The ligatures were then taken off, the wire riveted with an automatic mallet, and the surfaces polished. Afterward the posterior surface of the tooth was filled with cement-amalgam, and the filling contoured. The tooth is apparently as perfect now as it was when I first inserted the wire seven years ago, and there has been no irritation or inflammation, although this tooth was split through the bifurcations of the root.

In March 1908, a lower first molar which was in bad condition also was split longitudinally. I did not care to drill a hole through the molar, so a platinum band was adapted and cemented to the tooth. That tooth is still in as good condition as could be expected. It is, however, a diseased tooth, and always will remain such, but it is in better condition now than before the band was put on.

In March 1909, the same patient split the upper first molar on the same side, and that tooth was treated in the same way as the bicuspid. It also is in perfect condition at the present time. This simply shows that split teeth need not necessarily be extracted.

Some two months ago a patient came into the office holding a black tooth in his hand, which had been knocked out the night before in playing basket-ball. The patient had been carrying the tooth around in his vest pocket and happened to show it to my son, asking him what he should do with it, and he was told that he had better have it replanted. I opened the badly discolored tooth, removed the pulp, resected the apex, and sterilized the tooth in a weak solution of formalin. The tooth socket was then cleaned out, and the tooth forced into proper position. An impression was

taken, and a silver plate swaged to fit over the masticating surfaces of the canines and the incisal edges of the incisors, and cemented into position the next day. Two weeks later there was no irritation or inflammation, and the tooth was practically free from soreness. I am now watching the result of this implantation of a tooth which had been carried around in a vest pocket.

Technique of Making a Carmichael Attachment by the Casting Process.

By Dr. Dudley Guilford, Philadelphia.

When Dr. Taggart gave his first demonstration of the casting process in Philadelphia, I was impressed with its possibilities in connection with crown and bridge work, and among other things I saw that it would immensely simplify the technique of making the Carmichael attachment.

The preparation of the tooth for this attachment is a familiar procedure. It consists in cutting a groove mesio-distally across the occlusal surface of the bicuspid and extending this groove up to the gingival margin on both the mesial and distal surfaces. In other words, the groove is continuous, extending from the mesio-gingival margin down to and across the occlusal surface and up to the disto-gingival margin. In the preparation of the canine, the groove is cut in the same way except that it extends across the lingual surface of the canine and then up to the gingival margin both mesially and distally. When this has been done, the lingual portion of the tooth is "coned" so that the wax pattern will draw and the finished attachment will go to place without leaving a space at the neck of the tooth.

After trying a great many methods for making the wax pattern, I have developed the following technique, which is found to be by far the most satisfactory:

A matrix of thin copper or phosphor bronze is placed about the tooth in such a way that the lingual portion is surrounded by the matrix—the ends of which extend buccally and are held by the operator's left hand. This matrix should not be held closely against the lingual portion of the tooth; there should be, in fact, a space of 1/32 of an inch or more between the matrix and the lingual surface at all points.

The tooth and matrix are then wiped with a pledget of cotton dipped in liquid soap. A rather large piece of casting wax, having previously been mounted on the end of a probe, is now heated with sufficient rapidity over a flame for the exterior of the wax to be completely melted while the interior is still comparatively firm. When it is in this condition the mass of wax is placed over the tooth with the matrix in position and pressed home by an assistant, or the operator may use one of the fingers of the right hand not engaged in holding the probe.

If this technique is followed, it will be found that the wax has been forced up to and often under the free margin of the gum and that the pattern is perfect. It will be readily seen that if the heating has been properly done, the firm interior of the wax acts as a piston, and forces the fluid exterior to the finest detail, thereby insuring a perfect pattern.

The wax is now trimmed to proper shape and thickness, and at the cervical margin it is worked up under the free margin of the gum, using a warm instrument for this purpose. If the pattern is then mounted on a sprue and cast in 5 per cent. platinous gold, the result should be a very perfect Carmichael attachment.

In using this technique I have found it necessary to use a wax which will stay fluid rather longer than the ordinary casting wax. To obtain this, I melt together pink base wax 1 part, and S. S. White black inlay wax 4 parts, by weight. This is poured into an oiled dish to the depth of about one-quarter inch, and before it is entirely hard is cut up into small cubes.

The principle underlying this technique is that, in order to secure a sharp cast, it is necessary to have a mass of wax with a firm interior, which acts as

a piston, and a fluid exterior which can readily be forced into the finest detail.

A Crown with Cast Gold Base, Restoring a Large Portion of a Fractured Root.

By Dr. J. C. Curry, Philadelphia.

Occasionally we find portions of roots broken off, or so badly broken that it is not practical to retain them. I have been embarrassed by these conditions and used heretofore to remove the broken portion and try to restore the continuity of the surface by fitting around the tooth a band cut with a tongue so as to go under the gum, and in a measure make a non-irritating surface. Recently I have found another method which I submit to your consideration. The case in question was that of a young woman who, in going up stairs rapidly, sustained a jar so violent that the lower teeth were thrown against the upper in such a way that a section was split from the labial root of one of the upper teeth. The split extended to approximately two-thirds of the length of the tooth in such a way that it made a wedge with the planes extending upward and outward. I first arrested the hemorrhage with adrenalin, and then plugged the pocket with temporary stopping, which I allowed to extend a little over the margins. The next day I removed the stopping, repeated the adrenalin treatment, smoothed the margins, and took a wax impression of the firm part, allowing it to run out into the root-canal, which had been previously reamed out. I removed the wax impression and made a casting. After fitting the casting, I soldered a half-band to it, thus securing a base which will accommodate any kind of crown without causing irritation.

A Method of Protecting the Interdental Gum Septum in Cases of Peculiar Occlusion.

By Dr. Otto E. Inglis, Philadelphia.

For many years it has been known that when fillings are not contoured approximately in such a manner as to prevent the separation of the points of contact during mastication, food of shredded character, such as meat, will crowd into the interdental space and crush and inflame the gum septum. The mechanical irritation caused by this and the use of the toothpick and the attendant fermentation of the food particles gradually leads to an inflammation which may cause a deep-seated gingivitis, and even suppuration may follow. While usually classed with the pyorrheas this lesion has distinctive features, and usually responds happily to appropriate treatment by healing as far as is possible in consideration of the loss of tissue. It is astonishing how long patients will endure this condition in some cases, but often it is so annoying that relief is promptly sought. The tight contouring of fillings often produces the desired result, and if possible should be resorted to. At times several teeth are loosened by long-continued lack of contour contact, and in such cases, if there is a convenient filling, the teeth should be wedged until the teeth anterior and posterior to the wedge are tight; then a tight contour contact is made at that point, even though it be necessary to over-contour.

If such a condition exists and all the teeth involved are without fillings, it is best to wedge as before, cut a cavity in one tooth, and introduce an inlay with soldered contact point. The carbon impression paper is used to reduce any malocclusion caused by wedging. If a crown be present, it can be used like a sound tooth, and a cavity cut in it for the inlay. Sometimes in addition to the contact it may be well to allow a slight overlap of the inlay on to the marginal ridge of the adjoining tooth, which should be slightly ground so that antagonizing teeth shall not malocclude upon it.

The peculiar occlusion to which I wish to refer embraces that class of cases in which, owing to extraction and tipping forward, the distal cusp of a molar occludes between the mesial cusp of one molar and the distal cusp of another in

such manner as to force the teeth apart and force food into the space gained at the same moment. As this continues, both of the wedged teeth become progressively looser through a general nonseptic pericementitis, and a marginal gingivitis is established which may progress to deep-seated interdental gingivitis or pyorrhea. Especially when the distal tooth has no posterior support, contouring is often unavailing, though shortening the distal cusp of the occluding tipped tooth sometimes affords satisfactory aid.

For these cases I would offer a simple device which has proved useful. If two fillings are present, as is often the case, into one of them a trench is drilled about one-eighth of an inch deep and about a quarter of an inch long. In the adjoining tooth a shallow slot is cut about one-eighth of an inch long. A piece of iridio-platinum wire of the size of a tooth pin is fitted to extend from the distal end of one trench to the mesial end of the other. That portion which is to extend from the deeper on to the shallower trench should be flattened occlusally, and made into a rounded triangle on the contact side. Both sides are to be smoothed. The portion to be burnished should be serrated. Then soft amalgam is placed in both trenches, amalgamating the surface of the trench by rubbing. The wire is embedded into the soft amalgam and tapped to place, and the balance of the amalgam is wafered and trimmed to shape, being sure to expose the occlusal portion of the extending spur. This portion will play loosely in its trench, which it will fit as closely as the movement will permit. The portion in the deeper trench will be tightly held. If only one filling exists, it is trenched as before, and the marginal ridge of the adjoining tooth is slightly reduced. The wire is bent so that it will lie evenly in the trench and yet ride upon this ground point.

This device allows the spur to play in its trench, but as the teeth cannot move sufficiently to allow it to slip out, the return of the teeth to place returns it to its place. As food is forced up, this bar breaks its force so that shreds lap over it instead of being forced up to the gum. The gum usually responds by healing.

By this method, a wide space may be left at the gum, and, though food can enter it by floating to place, it can be washed out. Experience shows that such a space is better than close contact, as in the latter case food remains, to ferment. I have used this device for some fifteen years, and find it very satisfactory, employing at times a modification by fastening a spur to a crown.

The cleansing of these spaces with floss silk involves passing the silk through the gingival space and drawing it out around the spur, or through, in case of united crowns or inlays. As an aid to this, a wire bodkin is useful. To make these, the temper is drawn from the shank of an old Gates-Glidden drill, and the drill is bent into the form of a buttonhook. A six-inch length of fine regulating wire is thrown over this while in the handpiece. The loose end is grasped between the thumb and forefinger of the left hand. The bur is slowly revolved, and the wire run through the fingers. This twists the wire, but leaves a small loop or eye for the floss silk. This bodkin can be bent to a three-quarter circle and threaded through, coming forward toward the lips. It is grasped, pulled through, and the doubled floss thus introduced for use.

This device is as useful for cleansing fixed bridges as for the purpose described. Another useful device for cleansing the parts consists of a small tube of brass holding a wood point, which will cleanse the surfaces. The points are shoepegs, which can be whittled down to a conical point. This is also useful in cleansing bridge work and in self-prophylaxis generally.

Discussion of papers.

Dr. W. Sterling Hewitt. I wish to report a similar case to that which Dr. Salvas has described. The patient

was referred to me by a physician, with a very severe pain on the left side of the tongue. I had an X-ray made and consulted Dr. Stout in regard to the condition. I found two teeth, the upper left second molar and the lower left second bicuspid, badly affected by pyorrhea involving the apical space. I extracted these teeth, as the radiograph showed them to be in a rather hopeless condition. I also treated the pyorrhea, which had affected the rest of the teeth, and the pain in the tongue stopped. My treatment was pure guesswork, but it stopped the obscure pain on the side of the tongue which neurologists and nose and throat specialists had been trying for a long time to cure. I mention this simply because it is a curious case which seems to be parallel in some ways to the case reported by Dr. Salvas.

Dr. D. N. McQuillen. I was particularly interested in Dr. Salvas' remarks, because I think sometimes we do not look long enough for hidden causes. Within the last five years some rather remarkable cases of young girls about the time of puberty have come to my notice. One young girl, five years ago, presented regularly every month with intense pain in the lower first molar, which subsided in two or three days. Finally I called the mother and asked her if the child, who was about twelve years of age, was showing any signs of puberty, which the mother affirmed. I sent the patient to Dr. F. R. Packard, thinking of some possible enlargement of the turbinates. He treated the patient and the pain left, but recurred at regular intervals. This condition continued for about a year, and finally subsided. Only within the last few months Dr. Bell and I had a very similar case. The patient presented regularly every month with severe pain, localized in the lower first molar. After two or three months' observation, we persuaded the mother to take the child to Dr. Packard, who found the left turbinate very much enlarged. He treated her, and the pain entirely subsided. These cases show that we have to persist in finding the cause of these difficulties, and Dr. Salvas expresses a timely note of advice in regard to persistence in clearing up such obscure cases.

Dr. H. E. Roberts. Dr. Salvas has been more fortunate with his patient than I was with one of mine, in that his patient's husband was an intelligent man, willing to follow suggestions. I had a similar case of obscure pain in which I tried to get a radiogram. The patient had one made, but I have never been able to see it. It is in the hands of her physician, and he will not give it up. The pain has persisted for two years off and on, the patient being comfortable part of the time and in very great misery at other times. She insisted that the pain came from the upper left second bicuspid, but I could not find any pathologic condition in the tooth. As she persisted, however, I devitalized the tooth, and she seemed to be relieved. A short time afterward, however, she returned complaining of the same pain. Again at the insistence of the patient, the pulp was removed from the first molar. I tried to find out from the patient whether the rhinologist had ever been able to secure a passage between the sinus and the nose, and she said he had not, but that she had something like a clot or sebaceous mass which apparently came from the throat, or the posterior nares, into the mouth. The physician called it a mucoid cyst, and when this broke down, the rhinologist said, he could pass a sound into the sinus. The patient afterward had the impression that the first molar was the cause of the trouble, and insisted that it be extracted. I consented to this as it was of no great value, but the trouble remained. She continues to have these pains, and every once in a while something will rupture, giving her temporary relief, but I cannot obtain any information from the physician, and the patient is not willing to consult another. When this breaking-down of what the physician calls a mucoid cyst occurs, the patient has relief for a short time, but I wish I could get at the source of her trouble, like Dr. Salvas. I believe the trouble comes

from the antrum, and has nothing to do with the pulps of the teeth.

Dr. Edward C. Kirk. I was very much interested in Dr. Salvas' case report, but he has left me very much in the dark as to the cause of the difficulty which he was treating. From the report it seems that the extraction of two teeth brought permanent relief, but all we have learned as to the etiology of the case is that Dr. Cryer said it was due to "an impingement of the root of the teeth upon the superior dental nerve." Now just what does this mean? What is involved in this impingement? How do these roots impinge? What was the pathological condition about the apices of the roots concerned in the impingement and the relation of these to the nerves which produced the neuralgic pain? That is what we really want to know. It seems to me that, as far as the report goes, we have a statement in the form of words which do not convey a clear idea of the pathology of the lesion. I remember once going to see Harry Kellar in his legerdemain performance in which he did the well-known trick of apparently lifting a table from the floor by contact with the palm of the hand, which of course was done by means of a slotted finger ring on his middle finger that engaged the head of a pin driven in the top of the table. The audience was mystified; they of course had gone there to be mystified, and had paid their money therefor. A gentleman in the audience turned to his neighbor and said; "Isn't that wonderful? How did he do it?" The reply was, "By electricity." That explained everything and they were both happy, because they understood all about it. Similarly, the solution of this problem appears to be that "the roots impinged on the superior dental nerve." I should like to have a detailed definition of this explanation, and I regret greatly that Dr. Cryer is not here to tell us what to his mind that "impingement" meant.

There is another aspect of this question which has been referred to by Dr. McQuillen, namely, the multiplicity of lesions that can produce these paroxysms of neuralgia of an intermittent character. We see a great many of these cases at the university. I remember in particular the case of a patient who was brought by a physician to the clinic for surgical treatment, with the expectation and suggestion that one of the nerve trunks be resected. The patient had a history of paroxysmal pain extending over some eighteen months, and after very careful examination of the teeth we found an exposed pulp in one of the upper molars on the affected side; hence, instead of undergoing a surgical operation, the patient was referred to the operative clinic and under cocain pressure anesthesia the pulp was removed, which gave her permanent relief. There had been a slowly progressing caries with pulp-stone formation. This was distinctly a case of neuralgic irritation of the nerve trunk produced by peripheral irritation from progressing caries and finally pulp exposure.

In this connection I wish to call attention to something which does not seem to have made an impression on the minds of the dental profession, and that is the contribution made by the late Dr. Louis Jack in regard to diagnosis of pulp disturbances by the thermal test, the technique of which he has reported in full in several editions of the "American Text-book of Operative Dentistry." This test he calls the "temperature tolerance of the pulp," or the difference in the maximum and minimum ranges of temperature tolerance resulting in cases of pulp disturbances. I do not think that the dental profession has properly observed or appreciated the importance of this means of diagnosis. It is most important, and enables one to determine exactly which particular tooth is causing the trouble by the difference in thermal reaction when the test is properly applied.

Dr. Roberts' discussion brings up the question of obstreperous patients. I am quite unable to understand why we have such patients. I shall publish a report in the Dental Cosmos of a very interesting case which illustrates the difficulties which some of our colleagues

have in dealing with the cases that are unmanageable. How can a patient presume to come to a dental operator for treatment and object to his treatment? What right has the dentist to submit to such an attitude? Such patients would not dictate to their physician or priest. They presumptively go to the dentist as an expert, and it is beneath the dignity of the dental profession to submit to that kind of dictation. I submit that as a fundamental proposition.

Dr. E. R. Sausser. In the examination of the oral cavity for the origin of reflex pain, I think dentists usually are very unsystematic in their diagnostic procedures. Too often are such examinations made in a cursory way. Usually the teeth are first examined for cavities of large dimensions, and, there not being any, the patient is given the iodin treatment and told to take aspirin in the hope that this will allay the pain and cause the patient to forget his trouble. When the patient returns, the dentist thinks of some other simple condition. Not finding this, he decides that the trouble may not be of dental origin. Such efforts are feeble and reprehensible. If the dentist has qualified himself for the practice of dentistry, he should assume a more scientific attitude toward these cases. He should first study the case, and consider the history, sex, habits, etc., of the patient. Then, if necessary, he should secure a radiogram. With this aid, the shape of the pulp chamber should be very carefully studied—and we should be very familiar with the normal shape of the pulp chamber of each tooth, because abnormal conditions thereof can be the origin of the trouble. There are many conditions which we must look for, such as secondary dentin, pulp nodules, malposed and malformed roots, abscesses, etc., which conditions, one after another, must be eliminated before we can consider the examination a thorough one.

Dr. E. C. Palmer. Did you remove the fillings from these two teeth?

Dr. Salvas. Yes.

Dr. Palmer. I should never consider that tooth all right because it appeared to be so on the surface. I remember hearing Dr. Flagg tell of the case of the superintendent for the erection of the buildings of the Centennial Exposition, who gradually lost the sight in one eye, the other eye also beginning to be affected. On examination it was found that his teeth were apparently in perfect condition. Two teeth that were suspected contained beautiful gold fillings, but, as a last resort, these fillings were removed, and in one of the teeth an inflamed pulp was found under the filling. The tooth was devitalized, and the patient regained his eyesight completely, showing that the condition was caused by that tooth. Speaking of the necessity for anatomic knowledge, it is not the normal but the abnormal anatomy of the teeth which is important, especially when there is a filling in a tooth. Within the last ten days I had occasion to devitalize a canine on which I put a band in order to supply a missing bicuspid. The deciduous canine had been allowed to remain until middle life, and I had no more than penetrated the enamel when I perforated the pulp. The normal position of pulps does not give us any indication as to whether a pulp may not be abnormal in certain cases, or whether a filling may not be causing trouble.

Dr. J. C. Curry. In conjunction with a nose-and-throat specialist who had one of my patients under treatment for congestion of the frontal sinus, I finally decided to have a radiograph made, which revealed a third molar in the maxillary sinus.

Dr. Salvas (closing the discussion of his paper). The objection raised by Dr. Kirk is indeed pertinent. Let me remind you, however, that this case was reported merely as an incident of practice, and not as a treatise. The fact remains, nevertheless, that the failure to get at the cause is exasperating, to say the least. We were absolutely certain in this case that the pulps were not involved; there were no pulp stones; there was nothing to indicate that the teeth were in any way responsible for

the trouble. It was for the expert anatomist to see what we could not see. I regret that Dr. Cryer is not here, as he might be able to tell us more of the case from an anatomical point of view.

Dr. W. A. Capon. I should like to ask Dr. Palmer whether in his opinion there is any difference between the black copper cement mentioned and the lighter colors that are being marketed at the present time, and whether the black cement has better preserving qualities than do these others.

Dr. Palmer. I think black copper cement shows better after it has flaked off; it is stickier, and seems to have germicidal qualities.

Dr. E. T. Darby. In support of Dr. Palmer's argument, I wish to say that black oxyphosphate of copper is the only preparation that is fit to be used under these conditions. Red or white so-called oxyphosphate of copper is not the same material. I want to express in the highest terms my appreciation of the treatment which Dr. Palmer has applied to his daughter's teeth. It is a practice I have followed for years, ever since oxyphosphate came into use. Instead of using a solution of formalin, I use a solution of silver nitrate, the value of which should be equally as great in the treatment of permanent teeth as it is in the treatment of deciduous teeth. Furthermore, inasmuch as we use black oxyphosphate of copper, there can be no objection to silver nitrate because of its staining properties. I know of nothing better for the sulci of the first permanent molars than the treatment suggested. The teeth should be thoroughly cleansed first, all the food débris removed from the fissures, then the silver nitrate applied and the surface dried. Then the material is laid upon the surface, the index finger put over it and held there for half a minute, or vulcanizable rubber is put over it and held there until the cement hardens. The excess is scraped off, and the resulting filling is one of the best means for the preservation of the teeth. Dr. Kirk reminds me that Dr. Perry was in the habit of employing oxyphosphate of zinc for this purpose before the oxyphosphate of copper was placed on the market.

Dr. Palmer (closing the discussion of his paper). I just want to say to Dr. Darby that I do not use formalin, but iodin first, and then clean the teeth with alcohol, then with bichlorid, and with alcohol again, and then apply the oxyphosphate of copper. Someone asked whether this is good practice in permanent teeth? It has proven very valuable in the permanent teeth in the case described. I have used this method in many cases, and no tooth, after having been treated in that way, has required repair.

Dr. W. A. Capon. I am very much interested in the Carmichael attachment, having employed it very soon after it was suggested, but have found difficulty in properly introducing the wax around the gingival border as thin as I desired it. Dr. Guilford holds the matrix in one hand well to the border of the tooth and forces the wax in afterward. I cannot understand, however, if he holds the matrix as he says, how he gets the wax in the fine line he speaks of.

Dr. Guilford. The matrix is held in such a way that the margin is fairly heavy. The wax impression is removed immediately and put back, so as to make sure that, when finished, it will come off easily. Then it is trimmed fairly thick at the gum, and with a warm instrument pressure is created just sufficient to squeeze the wax out into a thin margin and under the free margin of the gum.

Dr. Otto E. Inglis. Having had some trouble in holding the metal strip in a manner similar to Dr. Guilford's, I devised an indirect method which has proved satisfactory to me. After preparing the tooth for the Carmichael attachment, I take an impression with Kerr's modeling composition, using all the available fingers of both hands to force the impression material to place without

allowing it to slide away from the tooth. My assistant then applies ice-water to the composition, so that it is quickly chilled. If the compound happens to get on the buccal side, where it is likely to cause the impression to draw, I cut it away with a chisel, and then withdraw the impression. I also take a small bite with pink paraffin wax. I believe it is commonly supposed that inlay investment compound cannot be used for making models, but that is not correct so far as the Taggart compound is concerned. The model can be made with it in the usual manner, and the modeling composition withdrawn after heating in water. This produces an accurate model of the tooth, but not a good replica of the portion of the tooth beneath the gum; therefore it is necessary to score the model at that point. I then take a narrow strip of 40-gage platinum plate, set it edge down into the scoring and close to the model, so that the wax will not go inside. I then place the wax bite on the occlusal surface of the model tooth, wax the case up, and carve. This secures the casting pattern. I then cut away all the model except the portion beneath the wax and platinum, leaving a little excess to catch in the investment; this is then spread, wetted, and invested, and the casting is made directly upon the original model. When cast, the gold will have picked up the platinum, but will not have stiffened it much. As the platinum is thin, it can easily be burnished to the cervix of the tooth in the mouth so as to render the adaptation exact. I then flow three pieces of solder on it to stiffen it. I find this quite an easy method, if one does not care to work with the wax pattern at the first sitting. While I have not tried it, I see no reason why a model made of investment material should not be used in the indirect method of constructing inlays, as a wax bite can easily be set up on it. A difficulty might arise in obtaining a correct impression, and by injuring the cavity margins on the model.

Dr. McCULLOUGH. Has the essayist had any difficulty in getting the cast model into position on the tooth?

Dr. GUILFORD. No. I have found, however, that in carving the model, the wax, being somewhat softer than ordinary casting wax, will become a little loose. In fact, I usually purposely loosen the model and then burnish the margins to fit exactly, and I then have no trouble in getting the casting to go to position.

Motion was made and carried that a vote of thanks be extended to the essayists of the evening.

Dr. DARBY. My attention has been called to the fact that since our last meeting two of our members have died, and it seems fitting that some action be taken by the society with reference to the death of Dr. Truman and Dr. Jack. I therefore move that the society take some action with reference to the demise of these two gentlemen.

The motion was carried.

Dr. Curry appointed a committee to draft resolutions on the deaths of Dr. Truman and Dr. Jack, consisting of Dr. Darby, Dr. Kirk and Dr. McQuillen.

The treasurer, Dr. Bassett, presented the Report of the Treasurer, and the Chair appointed as Auditing Committee to audit the books, Drs. Capon and Swing.

Motion was made and carried to adjourn.

NATIONAL DENTAL ASSOCIATION—SOUTHERN BRANCH.

Sixteenth annual meeting of the Southern Branch of the National Dental Association, and the forty-seventh annual meeting of the Georgia State Dental Society, held at Atlanta, Ga., June 4, 5, and 6, 1914.

THURSDAY—*Morning Session.*

THE sixteenth annual meeting of the Southern Branch of the National Dental Association and the forty-seventh annual meeting of the Georgia State Dental Society was held in Atlanta, Ga., Hotel Ansley, June 4, 5, and 6, 1914.

The meeting was called to order Thursday morning, June 4th, at 9.30 o'clock, in the ballroom of the Ansley Hotel, Atlanta, Ga., by the president, Dr. W. A. Dean, Tampa, Fla.

Rev. Dr. JOHN F. PURSER, Atlanta, invoked divine blessings on the deliberations of the meeting.

Mr. F. O. Foster, Atlanta, introduced Hon. JOHN M. SLATON, governor of the state of Georgia, who welcomed the association to the city of Atlanta.

Dr. B. HOLLY SMITH, Baltimore, responded to the welcome address on behalf of the association.

The first order of business was the reading of the President's address by Dr. W. A. DEAN, Tampa, Fla.

Dr. Tignor, vice-president, occupied the chair while the President read his address, as follows:

President's Address

By W. A. DEAN, D.D.S., Tampa, Fla.

Ladies and Gentlemen and Fellow Members of the Southern Branch of the National Dental Association,—It is with pleasure that I greet you again. A year ago you honored me with the high office of president of your organization, and the distinction accorded me in that trust arouses in me the deepest feelings of gratitude to you. If I have failed to fill the post with credit or satisfaction, it is not due to a failure to feel keenly the compliment nor is it from a lack of willingness to serve you. I fully recognize its meaning and come to you with no little trepidation to render an account of my stewardship. And before you sit upon my case, I would fain erect a sign first employed in a western mining camp on the occasion of the annual dance, when the violinist was in great danger of having his head shot off because of his lack of musical talent—"Please don't shoot the fiddler; he is doing the very best he knows how."

QUESTION OF DISCONTINUANCE OF THE SOCIETY.

You had for the principal item under consideration at Old Point Comfort, Va., last year, the question of whether or not it was wise or expedient to continue the Southern Branch. It was pointed out at that time that it was a third link; that we have the state organization, the Southern Branch, and the National Association, and the question seemed to be, "Can we get sufficient interest in the matter of attendance, the proper talent for programs, and the necessary finances to keep alive the three separate bodies?" After long and careful consideration it was unanimously determined to continue the Southern Branch, and there was enthusiasm enough apparent then to make the fu-

ture of our work seem simple. But the future—what is now past—did not sustain the hope, and it has been with the greatest difficulty that we have secured the co-operation here represented. Now, I am a believer in the idea that whatever is worth doing at all is worth doing well, and that what cannot be done thoroughly should not be done at all—but do not understand me to desire either to discredit your wisdom of a year ago nor to discourage your enthusiasm for the future. Instead, I propose one of two alternatives. We must, as I conceive it, either merge ourselves without reservation into the National organization, or lay the burden on the shoulders of a committee large enough and with force of character sufficient to carry us over the natural obstacles that we have met in the preparation of the program and other important features of this present convention. Now, it is undoubtedly the part of wisdom at all times to proceed with due caution and to hedge every proposition to substitute some new plan for the old one with all the safeguards necessary to prevent the mistake of rashness. But the word "progress," which has been so constantly upon the lips of the nation during the past few months, means the substitution of new ideas for old ones. I have always been on the fence as to the two signs hung out by rivals in the shoe-repairing business in a western town—the one, "John Smith's Shoe Shop, Established in 1876," while across the street his rival hung out, "Bill Jones' Shoe Shop, Established Yesterday: No Old Stock on Hand." But this is one of the matters that must be squarely met if we are to live as an organization; for when we cannot offer on our program and in the fellowship that our conventions furnish some values, we shall certainly cease to appeal to the busy, wideawake, and earnest fraternity of American dentists. Do not let us fool ourselves into the delusion that they will come, unless we have something worth while. They are ravenous for vital inspiration and instruction, but surfeited on platitudes and humdrum elementaries.

NAVAL RESERVE CORPS.

Another matter of importance is the possibilities of the Naval Reserve Corps of the United States. In this corps our government has made provision for dentistry to enter the navy on practically the same basis as medicine and surgery in general have been accorded, and promises much for our profession. I have some circulars regarding this matter, and in the open sessions I would be glad to have a free discussion thereof by all who have a taste for naval life, and will be glad to furnish information covering the question fully to anyone who applies for it.

WORK OF THE RESEARCH COMMISSION OF THE N. D. A.

The March number of the official *Bulletin* of the National Dental Association contained a most excellent article entitled "Report of Progress of the Scientific Foundation and Research Commission," by the Executive Board.

There are many features of this splendid report that are eminently worthy of our careful consideration and free discussion, and I hope the members will give each other the full benefit of any details concerning this work that may have come under their personal observation.

I want especially to call your attention to the scope of the work undertaken by this Research Commission by a very brief reference to the general captions that cover the more immediately important work it is accomplishing:

Tooth Decay, Its Causes and Prevention.

Oral and Dental Infections and Their Relations to General Systemic Infections and to Distant Infections and Manifestations.

Pyorrhea Alveolaris (So-called). Its Causes and Prevention.

Defective Tri-calcic Salt Nutrition (including Enamel Hypoplasia, Defective Tooth Formation, and Improvement in Artificial Baby Foods).

The Etiology of Dental Erosion and Its Prevention.

The Relation of Facial Deformity to Mentality and Imbecility, and Methods for Their Correction or Improvement.

The Relation of the Organs of Internal Secretion to Pathological Conditions in the Mouth, Including Its Secretion, Decay, etc.

Metallurgical Studies for Better Filling Materials and Inexpensive Platinum Substitutes.

A Knowledge of the Electro-chemistry of the Mouth, Including Its Relation to Obscure Neuralgias. Tooth-root Substitutes.

—and many other subjects and problems.

This Foundation is in my opinion of the utmost importance to all of us, and unless we become actively identified with it and support it with our interest as well as with our finances, we must all suffer an incalculable loss. This work promises what no branch of our profession has ever done, viz, to go to the bottom of those vexing and unsatisfied doubts and uncertainties that we have all experienced, and for the investigation of which we have hitherto depended almost wholly upon the medical world, which at best gave us only meager and sporadic help. This is an age when the old Arabic apothegm is most appropriate: "He that knows not, and knows not that he knows not, is a fool; shun him. He that knows, and knows not that he knows, is asleep; wake him. He that knows, and knows that he knows, is wise; follow him." I therefore recommend this Foundation to your most earnest consideration.

IMPORTANCE OF STATE ORGANIZATIONS.

Again, there can be no doubt in the mind of anyone who will but for a moment consider it, that we owe it to our best interests to identify ourselves with our state organizations, and in turn have these affiliate with the National society as bodies. There are of necessity matters of great importance that are peculiar to geographical boundaries, and the zest and uplift that come to those who mingle with their fellows of other states —of *all* of the other states—is such as to deserve our hearty interest, and unless we overcome the apathy that exists in certain quarters of our great country, we shall miss much.

CO-OPERATION URGED.

Finally, let me say by way of recapitulation—Whatever we accomplish, such conventions as this may be made invaluable to all those who attend them, or they may fall flat. Co-operation, therefore, is indispensable, and this in turn is the expression of natural needs and cannot be legislated by arbitrary dictums; we are not creating any new appetites in the human anatomy, but we should wisely and intelligently supply healthy nutriment to those that already exist. By proper feeding, hunger is only quieted temporarily, and is renewed again at the next meal-hour, whereas indigestion and all the calamities of dyspepsia follow gorging of any kind or nature; and it is my most earnest desire to call attention to the problems that have confronted us during my incumbency, and to have the benefit of your wisdom in their solution.

I will ask the committee that passes upon and reviews this message to consider carefully the matter of the time of our meetings as they are related to or conflict with the meetings of the other of our allied bodies—I have several letters from those who would have been with us at this time had it not been for the conflict of dates—and to make such recommendations to the Executive Committee on this subject as they may deem appropriate.

I want, before retiring from this platform, to go on record as fully appreciating the splendid work of the various committees, and also of the Georgia State Association, whose guests we are, and who have by their far-famed hospitality made us doubly grateful. To the Atlanta Association of Dental Surgeons I wish to express my profound admiration and gratitude for its strenuous labors on program and entertainment as well as for the evidences of progress and attainment that characterize them.

Again expressing to you all my sincere appreciation of the cordial support and loyal and generous co-operation with which you have invariably sus-

tained me. I pray your further indulgence while we conduct the session of this convention.

Dr. Holland moved that a committee of three be appointed to report upon the address of the President.

Dr. Tignor appointed the following committee—Dr. Frank Holland, Dr. Joseph Eby, Dr. N. A. Teague.

The next order of business was the calling of the roll and the payment of dues.

Dr. Corley moved that the members of the Georgia State Society not members of the Southern Branch be accorded the privileges of the floor. (Motion carried.)

The next order of business was the reading of the following papers, which were discussed together—"Preventive Medicine in Dentistry," by Dr. J. G. Reid, Marion, N. C., and "A Few Thoughts on Oral Hygiene and Surgery," by Dr. N. G. Slaughter, Athens, Ga.

Preventive Medicine in Dentistry.

By J. G. Reid, D.D.S., Marion, N. C.

Preventive medicine had its dawn in the hygienic measures of Egypt, Greece, and Rome, was mentioned in the Mosaic law and in the teachings of Mahomet, but the modern scientist has first fully realized its true worth and mission. During the nineteenth century such strides in medicine, and especially in surgery, have been made as could never have been dreamed of by our forefathers, and today the dental surgeon ranks with the medical surgeon in the practice of preventive medicine. The establishing of the science of bacteriology, the discovery of the microscope, and the proving of the pathogenic nature of the bacillus of anthrax, all these have their part. Ever since the discoveries of our honored Miller, biological and chemical, surgical and mechanical investigations have been greatly strengthened and improved. The dental surgeon's daily operations are preventive medicine—whether they consist in filling a cavity, restoring a tooth, making a Brophy operation for cleft palate, or performing any of the many operations which devolve upon the dentist for the cure or prevention of disaster and disease.

PREVENTION OF DISEASE IN SCHOOL CHILDREN.

Our children are our hope, our state's and nation's hope, and it is upon the subsequent efficiency of these citizens in embryo that the future prosperity of our country depends. I believe in the near future every state will have adopted compulsory education. This is necessary, and just as necessary it will be for the state to go a step farther, and supervise the physical conditions and environments during school life so as to insure their reaching maturity unimpaired by preventable ills. By so doing we shall lessen the number of public charges and other dependents. It has been proved conclusively that the harmful influence of physical defects and diseases so often present in school children without the knowledge of their parents and teachers is a potent factor in retarding or arresting the physical, mental, and moral development of the children, when allowed to extend through childhood years. On the other hand, it has been just as conclusively demonstrated that many such defects and diseases, while pernicious in their growth and development, are either readily preventable or curable; besides, unless such defects are detected by a competent physical examiner, their presence is often not discovered until great damage has been done. It is all-important, therefore, that we should have competent examination of all school children by physicians, dentists, and trained nurses.

THE DENTIST'S RÔLE IN PREVENTIVE MEDICINE.

When the Oral Hygiene Committee selected forty of the most backward and hopeless pupils of the Marion

graded school of Cleveland, Ohio, and made a test of this class by setting right every defect found by medical and dental skill, the result after one year's test astonished all our nation, and graded schools are adopting similar tactics everywhere.

The paper read by Surgeon-general Dr. Rupert Blue at the National meeting at Washington, D. C., enumerating the many infectious diseases and discussing the relation of preventive medicine thereto, was an excellent one, and his interest in our behalf, along with that of other prominent officials and men of note, is doing a great deal toward placing our profession where it should stand. The watchword of both the medical and dental professions should be prevention rather than cure.

Let me quote from the noted Dr. Osler, who, while sojourning in this country, said: "You have one gospel to preach, and you have to preach it early and late, in season and out of season; it is the gospel of cleanliness of mouth, cleanliness of teeth, and cleanliness of the throat. The three things must be our text throughout life."

The editorial in the April Cosmos of 1913 quotes Dr. Chas. H. Mayo, the eminent surgeon of Rochester, Minn., who declared that it is evident that the next great step in medical progress in the line of preventive medicine should be made by dentists. He asks the question, Will they do it? We are a profession which has suffered from lack of proper recognition, but whose *personnel* has been equal to that of any profession. The appeals of such men as Drs. Osler, Mayo, Blue, and a host of others, at the head of the medical profession, who recognize our part in preventive medicine, renders it possible to answer Dr. Mayo in the affirmative. Most assuredly we will rise to the task, aided by possibilities at hand, the scientific research work, and the oral hygiene movement that is spreading all over our land, and take our stand in the front ranks of surgery and preventive medicine. The authorities of our state are already coming to recognize us along with the doctors of medicine, and are appointing dentists to important positions. Now that our opportunity is at hand, we cannot sit down and wait for it to develop, but must each one put his shoulder to the wheel. We must do as Dr. Osler says, "Preach in season and out of season." We must make it a point to interest the children as well as their mothers; when we have accomplished this, we shall have the men's co-operation.

If we want things done, now is our time to join the progressive medical society whose heads have already recognized our part in surgery and preventive medicine; for in a progressive age, with a progressive President, a progressive Congress, both House and Senate, a progressive Legislature, we ought to be able to have such laws passed as a great profession in a great land needs.

PRESS DISCUSSIONS ON ORAL HYGIENE.

I would not have you think that I believe we are asleep. We are not. We are doing a great work, but the time is now ripe for us to be more widely awake, and to begin to reap the harvest that is in store for our profession; that is, place it where it rightly belongs. The many aseptically clean dental offices all over the country, the great movement in oral hygiene conducted by many of the states, cities, and towns, the excellent preachings of the medical profession as well as ours, and the placing of trained nurses in the graded schools—all are doing their work. I read not long ago in a Des Moines, Iowa, paper a comment on the duties of trained nurses in graded schools, also an excellent full-page article in the *Ladies' Home Journal* of September 1911, written by Luther Hasley Gulick, M.D., suggesting many brilliant ideas to the profession, and placing this problem in an ethical way, before the public.

DENTAL HYGIENE IN PRISONS.

Sheriff Quinn of Boston, Mass., lately published an article in one of the local

daily papers, saying: "Teach a man to care for his nails, his hair, his ears, his eyes, and particularly his teeth, and you teach him the first law-abiding principle of decency." This sheriff contends that a man's whole mental attitude is transformed if he practices habits of cleanliness and neatness. He has installed a dental chair in the Charlotte st. jail, and has arranged for dental treatment of all the prisoners in need thereof, showing his idea of how prisoners, even, ought to be treated. This is his idea of one of the first aids in the prevention of crime.

Statistics show that 4 per cent. of the annual death-rate is due to old age, 4 per cent. to accident, and 92 per cent. to preventable diseases. What a work for physicians and dentists! The mouth, the gateway to our body, if not kept clean furnishes an incubator for all disease germs to be carried directly into the system. When we have trained nurses and dental attendants in all our schools, large factories, prisons, and sick-rooms, when all the air supplied by ventilation is sterilized, when the patient's mouth is kept clean, in fact when everything is kept sanitary and everybody is taught sanitation, we shall have less disease, less crime, higher ideas, and a nobler civilization.

We find written in the Law of all laws, "For whatsoever a man soweth, that shall he also reap." Equally is it true, if we sow germs, we shall reap corruption; if we sow prevention, the harvest will be health and happiness.

We all agree that a dental office should be the cleanest place in all Christendom, and if we do our duty as dental surgeons it will be so. Cleanliness is next to godliness is a true and worthy saying.

As we live first for those who love us, let us each for himself say, I live in a great measure—

> For the wrongs that need resistance,
> For the cause that lacks assistance,
> For the future in the distance,
> And the good that I can do.

A Few Thoughts on Oral Hygiene and Surgery.

By Nathaniel G. Slaughter, D.D.S., Athens, Georgia.

When Dr. William Osler, probably the greatest living authority on general medicine, says there is no one single thing more important in the whole range of hygiene than hygiene of the mouth; when Dr. William Hunter, the great English surgeon, says no physician or surgeon would tolerate that a patient with a foul and septic ulcer in his forearm should from time to time apply his lips to the ulcer to clean it; and when Dr. Chas. Mayo says that the next greatest step in medical progress, in the line of preventive medicine, should be made by the dentist; when not only the members of the medical fraternity, but intelligent men and women everywhere are looking to us for counsel and advice in the prevention of not only diseases of the mouth, but countless other diseases that originate in and are aggravated by an unhealthy oral cavity, then it is time that we should wake up and realize that we have a duty to perform.

It is said that no work on internal medicine contains as yet any comprehensive discussion on oral sepsis and its relation to some of the most destructive diseases. Is there not an opportunity to co-operate with the medical practitioners in the study and treatment of diseases so closely related to the oral cavity? How often do we see blind abscesses from which pus is being constantly absorbed into the system, or a chronic abscess with a fistula is pouring pus into the mouth constantly—and often, if these lesions do not cause pain, dentists are content to pass them by, little expecting any serious complication.

Dr. C. N. B. Camac, in the February number of the *American Journal of the Medical Sciences,* reports several cases of arthritis and endocarditis, the infections coming from blind abscesses or pus cavities in the mouth.

Have you ever gone into a schoolroom filled with children from the most

intelligent and refined homes, where hygiene and preventive medicine are practiced, and also with children from other homes where hygiene is unknown, and where sanitary conditions are bad, and studied the faces of these children? How bright and cheerful the first, how pale, sallow, and dull the others! Have you ever talked with the teacher about the difference in the progress of these two kinds of children?

A short time ago a lady came to my office with three bright children of four, six, and eight years of age for examination, and though the mouths of the two youngest children were in perfect condition, the mother was very much distressed because the oldest child had two small cavities in the deciduous molars. On the other hand, how often children are brought to us at this age with their mouths literally filled with pus caused by broken-down, decayed teeth and chronic abscesses, pus germs constantly being absorbed into the system. Is it any wonder that we so often see enlarged tonsils and adenoids, stomach trouble, and anemia associated with mouth conditions of this sort? In truth, it is nothing short of criminal to bring children up without giving them a better dental equipment and appreciation thereof. And we are going to be held responsible unless an improvement is made in the hygienic condition of some of the children's mouths of the present day. It is true that we have made progress. We have accomplished a great deal more than the most optimistic believed us to be capable of. Oral hygiene, where practiced, has not only saved the teeth and prevented disease conditions of the mouth, but has gone far beyond that and prevented many other constitutional diseases. The very fact that we know that oral hygiene will accomplish so much should inspire us to do greater things. We should forget the past and press on toward the prize of the high calling which we represent. The very fact that we know these conditions will make our responsibility much greater, but our opportunity will also be greater.

Did you ever realize that if we can by the proper training and service change a weakling into splendid physical manhood, or alter the facial appearance of a young woman from one of idiocy to that of beauty, the application of oral hygiene is worth while?

A woman came to my office from a near-by town, stating that she did not consult the local dentist because, when she had gone to see him before, he examined her mouth without washing his hands. This shows not only lack of common decency, but of aseptic dentistry. Is it reasonable to expect an intelligent laity to follow our leadership in matters pertaining to preventive dentistry and medicine when such incidents as these occur every day?

I was talking to a prominent dentist of our state about the necessary precautions in operating upon tuberculous patients, and he told me that he was in the habit of spraying his mouth and throat occasionally while operating on such patients.

Let us catch a new vision of preventive dentistry, and by example and precept pass it on to those who need it most. Then will come to us the reward of duty well done, and we certainly owe to humanity the very best that we have. We owe to each other advice, counsel, sympathy, and fellowship, but with all of these, each man has to pave his own way, fight his own battles, and receive his own reward. A wise poet has most beautifully said—

It matters not how strait the gate,
How charged with punishment the scroll,
I am the master of my fate;
I am the captain of my soul.

Discussion of the two papers.

Dr. T. P. Hinman, Atlanta, Ga. It is with a considerable degree of appreciation that I begin this discussion. I appreciate the fact that the young men of the profession are awakening to the necessity of investigation along the line indicated in these papers. I cannot, at this time, pass the matter by without making a few statements with reference

to the work which has been done by the Scientific Foundation and Research Commission of the National Association. Both of the papers have called attention to the fact that oral infection is a source of systemic disorder. Dr. Slaughter calls our attention to the claim of a certain physician that arthritis, articular rheumatism, septic infection of the heart, endocarditis, etc., have been traced to oral infection, but I wish to impress upon you that we have had to wait for the dentist himself to demonstrate to the world the positive fact that infections from periapical alveolar abscesses do cause these troubles. It remained for Dr. Hartzell of Minneapolis to take cultures from an alveolar abscess and by injecting into rabbits produce septic endocarditis in twelve instances. The medical men said it was possible, but never demonstrated it. Dr. Slaughter calls attention to the fact that Dr. Mayo made an announcement that the next great step in preventive medicine would have to be taken by dentistry, and he, in 1913, threw down the gauntlet to the dental profession, which took it up and is now showing to the world that this great step is being taken, by demonstrating the possibility of systemic diseases of dental origin.

You have probably heard of the work of the National Dental Research Commission. Its purpose is to ferret out and demonstrate to the world not only the necessity of oral hygiene, but a great many other scientific facts. At this time I wish to state, with the permission of the chair, that this demonstration of septic endocarditis as well as articular rheumatism of dental etiology which Dr. Hartzell has made is due entirely to the aid which the Scientific Research Commission has given this researcher to enable him to carry on the work in the laboratories of the University of Minnesota. President Vincent of that university did not meet us halfway only; he came over the line, and gave us the use of all the equipment of the University of Minnesota so that we might be able to carry on this work. Dr. Hartzell, Dr. R. W. Bunting, Dr. Price, and Dr. Black are all working under this commission, devoting their time and energy gratuitously. With the money collected as a voluntary offering by the dental profession—and I am proud to say that they have responded generously, some societies having given as much as four thousand dollars—each one of these investigators is provided with an assistant who carries out his tests and ideas, the directors of this work receiving absolutely no remuneration whatever. If these men are willing to make such sacrifices, I think we as a profession should support them. I have just received a letter from Dr. Price telling me that he has recently succeeded in demonstrating a substitute for iridio-platinum, which has all the properties of iridio-platinum and is superior to it in some respects for dental use. From the standpoint of returns to you, that will mean a great deal. A piece of iridio-platinum seventeen inches long, of No. 16 gage, costs about seventeen dollars, but a piece of the same dimensions of the substitute, as demonstrated under the auspices of the Research Commission by Dr. Price, will cost, I believe, about one dollar. So you see that you will get your money back in the first year. I believe that the work of this commission will give dentistry a position not necessarily on a level with, but in some respects above the medical profession. I do not wish to disparage the work which the medical profession has accomplished, but I want you to realize that it is only by such researches that we shall be able to demonstrate to the world the necessity of oral hygiene and the establishment of physical perfection through oral health.

Dr. H. W. Morgan, Nashville, Tenn. Some three or four years ago, at a dinner, I heard one of the most prolific writers on dental subjects say that "The dental profession is not a reading profession," and he stated as evidence of his contention that he had written as many as ten books, and had never yet received from the sale of these books enough to pay for the binding of any one of them. He said he had written

about ninety-six separate articles, each of which contained some great truth relating to the profession of dentistry, but he had never seen any of his thoughts quoted with proper credit given to their author. This morning we have had a demonstration in contradiction of both these statements. Both of the essayists have quoted from that now famous article by Dr. Mayo. Nothing that I have ever read in the English language has been so often quoted, or has stirred the dental or any profession as that statement of Dr. Mayo. I do not believe that anyone will deny that these sentences have been more often quoted in the last fifteen months than anything ever written about dentistry.

The sentiments expressed by the essayists are being entertained by every man who is interested in dentistry and has its scientific progress at heart. We live in a scientific age. All that we as a profession are, all that the medical profession is, is the result of the work of scientists—not of men actively engaged in professional work, but of men of a scientific trend of mind and trained to scientific working and thinking. We cannot all be geniuses; we cannot all be inventors; we cannot all delve deeply into the realm of science. Here and there a man is endowed with the faculty to look deeper into the mysteries of nature than the rest of us. Sometimes, however, instead of lying deeper, the solution of a problem lies right on the surface, but we have overlooked it. And perhaps the greatest truths are scattered all around us, and we are overlooking them, while looking 'way beyond! The first essayist alluded to the contributions of the Hebrews to medicine. They have given us much, and perhaps were ahead of their time, surely much farther than the benighted Indian who still sounds the tomtom in the hope of scaring away the evil spirits. Coming down the ages, we find that it was the Greeks who were the forefathers of medicine and dental science, taking it probably to Rome. Who was it, however, that gave us our pharmacopeia, and who were true scientists for ages? It was the Arabians. They furnished us with a knowledge of materia medica upon which we have builded since that time. In all these ages medicine was gradually drifting toward greater knowledge, but only gained a secure foothold after many centuries of hard scientific effort, until the discovery that hydrophobia might be cured through vaccine therapy. After that came the work of Lister, who believed that germs were floating around in the atmosphere, and that if wounds were protected by water, no trouble would come from the atmosphere. What was the result of his work? The error was soon discovered. Our knowledge of preventive medicine has increased to the extent that at the great medical congress held in London last year, one-half of the entire time was devoted to preventive medicine. The medical profession has drifted away from the exclusive consideration of surgical procedures, and is studying the same subject, prevention, which we are discussing here. It is indeed a great age in which we live. All that was said by the essayists with reference to the examination of school children meets with the hearty approval of medical men today. The impetus came to us from Germany, Norway, and Sweden, where they first began the examination of children for defective eyesight, until today it includes every phase of the child's health. Such examinations should not only include the school children; indeed, I believe the trained nurse is going to have the authority to dismiss the school teachers when they are not fit to teach. When a school teacher comes into a schoolroom in a highly nervous condition, the nurse should have power to advise her to go home until she is able to teach. Much of the backwardness of children is due to the fact that teachers come to school unfit to put themselves in harmony with the pupils whom they are to teach. The problem of prevention broadens every year. Last year I received an application from the superintendent of an asylum in Little Rock, Ark., who wanted a dentist for that institution, and this year I had another such call from an

institution in Tennessee. The medical profession recognizes the fact that the mouth is the portal of entry for three-fourths of the diseases which the human body is heir to, and they realize that it is their duty not only to look after the public, but the unfortunates in these institutions. The work of prevention, therefore, which has been advocated by the essayists, deserves the highest commendation, as it is an important contribution to the efforts toward the relief of suffering humanity.

Dr. Reid (closing the discussion of his paper). I appreciate very much the discussion of my paper. Dr. Morgan's remarks about the ancients remind me of the statement that we are getting to where the Chinese have been for years. They pay their doctors for keeping them well, and if they become sick, they do not pay them. Though the Chinese are considered heathens, this seems to be a good plan.

The scientific work of the National Association is wonderful, and will surely lead to many important discoveries.

Dr. J. P. Corley, Greensboro, Ala. The presentation of such papers as these, by such men as these, before such a body as this, indicates that the star of scientific dental altruism has arisen. We might with profit and pleasure spend the rest of this entire session in discussion of these two papers. I cannot see the papers passed without expressing my gratitude and appreciation to the scientific dreamers who have entertained us with their papers.

Dr. Slaughter (closing the discussion of his paper). I wish in closing simply to thank Dr. Morgan, Dr. Hinman, and Dr. Corley for the discussion of these papers.

The next order of business was the reading of a paper by Dr. J. P. Corley, Sewanee, Tenn., entitled "Ways and Means."

The next order of business was the reading of a paper by Dr. H. C. Brown, Columbus, Ohio, entitled "The Status of Our Dental Organizations."

The next order of business was the reading of a paper by Dr. Gillespie Enloe, Atlanta, Ga., entitled "The X-ray as an Aid in Diagnosis."

[This paper is printed in full at page 409 of the present issue of the Cosmos.]

The meeting then adjourned until the Friday morning session.

Friday—*Morning Session.*

The meeting was called to order on Friday morning, at 11 o'clock, by the president, Dr. Dean.

The first order of business for the session was the reading of a paper by Dr. D. D. Atkinson, Brunswick, Ga., entitled "Impression Taking by the Green Method."

[This paper is printed in full at page 402 of the present issue of the Cosmos.]

Discussion.

Dr. P. E. Callihan, McRae, Ga. I have enjoyed Dr. Atkinson's essay very much, as I have also read with great interest the book to which he refers, which contains a description of this method in detail. There is so much in it that I would advocate, as he does, its purchase by anyone interested in this work. Like almost all dentists I was taught that for difficult impressions, plaster was the better material to be used, and I followed that plan for a long time; but after understanding this method, I have been able to take difficult impressions with compound in a very satisfactory manner, in fact, much more so than with plaster. Impressions taken in compound can be muscle-trimmed and corrected; which cannot be done with plaster. Compound is also indicated in cases where the plaster causes nausea, and where it is difficult to relieve this condition even after cutting away a good portion of the finished denture. By using a properly taken impression of modeling compound, we can secure a more comfortable and serviceable fit than with plaster alone. The es-

sayist has also fittingly pointed out that the fitting of the trial plate is the best time for securing thorough adaptation of the palatal surfaces, by allowing the patient to swallow and produce exaggerated movements of the mandible which make the yielding, warmed edge of the impression conform to the mouth, while otherwise we so often have to trim the finished denture.

In the more difficult lower cases I have made as many as a half-dozen plaster impressions before obtaining a satisfactory one; but I do not have such trouble since I have adopted the use of the compound.

Much that Dr. Atkinson has not mentioned may be found in the book. Without going into details, I wish to emphasize what the essayist has said about impression taking, because the entire success or failure of the construction of an artificial denture depends on the impression.

Dr. H. H. Johnson. I would like to ask Dr. Atkinson if the method he has outlined is intended only for edentulous jaws.

Dr. Atkinson (closing the discussion). In answer to Dr. Johnson I would say that this method is applicable to partial impressions of the upper and lower jaws, as well as for full upper and lower impressions. All of you who have made lower dentures appreciate the trouble of having a plate jump up all the time. As I said, you will have to study the book, and study it diligently, to understand this system, which is described there very much more fully than I could do it at this time. Dr. Lambright in one particular case asked me for an impression and requested me to send the bite along with it. After I obtained the impression and had muscle-trimmed it so that it would lie in the mouth properly, I put a little wax on the reverse side of the impression tray and had the patient bite into that, and when I sent him the case, both the impression and the bite were contained in that cup. Dr. Callihan has fittingly emphasized the correctability of the impression. There is one thing that one must avoid absolutely, that is, pressing so hard that the cup will come through the impression. If one falls short of material at any place, a little material is added to the impression, which is placed back in the mouth and made to conform to the jaw.

(To be continued.)

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Devoted to the Interests of the Profession.

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PHILADELPHIA, APRIL 1915.

EDITORIAL DEPARTMENT.

THE DEDICATION OF THE THOMAS W. EVANS MUSEUM AND DENTAL INSTITUTE SCHOOL OF DENTISTRY UNIVERSITY OF PENNSYLVANIA.

PROFESSOR ADAMI has very pertinently said that the development of a science is strikingly similar to that of the intellect of a child—which in the early period of growth is concerned mainly with the observation of phenomena about the causes of which he becomes increasingly curious, and rapidly passes into the stage of the perpetual "Why?"

In his search for the causes of phenomena he is, for the time being, satisfied with the explanations of his teachers and elders, and in this stage his sole dependence is upon authority. While many do not pass beyond this stage of deference to authority, others later discover that the explanations of their authorities are not always adequate or satisfying. They then venture to formulate explanations for themselves, and occasionally light upon truths having great breadth of scope and application. Stimulated by the discovery of their powers of generalization, they blithely construct hypothesis after hypothesis, only to find that many of them are disappointing because their conclusions have been drawn from insufficient data. They thus learn that scientific truth is not so easily wooed or quickly won, and go patiently to work

extending their observations of phenomena, content to study their relationships in the hope that some time the arcana of their inquiry may be revealed. The individual thus passes into the stage of intellectual manhood and of unfettered reasoning.

The simile is as directly applicable to the evolution of dentistry as it is to any other science, or department of human activity which develops into a science.

Dental education in its inception was confronted with problems the solution of which was attempted after the manner in which the undeveloped mind of the child studies phenomena, as portrayed by the foregoing quotation from Professor Adami. Its teaching and its practice were empirical, and its authority was the *ipse dixit* of the self-constituted teacher. The widening of the scope of dental knowledge has followed the discovery of the practical inadequacy of the data obtained from these earlier observations. We have, in our turn, passed through the age of hypothesis, the age when what was "theory" was justly regarded with suspicion, and the alternative faith in "practice," which was essentially a cloak for empiricism, was held up as the only safe mode of procedure; and while the age of empiricism is not by any means wholly passed, we have fully entered upon the more virile stage of scientific rationalism.

The demand is everywhere made for scientific investigation of the problems of dentistry in order that we may arrive at a basis of truth in relation to them. Hence it is that this general demand for scientific accuracy in connection with the principles and practice of dentistry has exerted its compelling influence upon the sources of dental education, with the result that the older methods are obsolete and dental educational methods are being revolutionized in response to the new and general demand for a broader scientific curriculum for the dental practitioner.

When, after what threatened at one time to be interminable litigation, the residue of the estate of the late Dr. Thomas W. Evans of Paris became available for the furtherance of dental educational ends, it was found that the amount practically available for the purpose was inadequate to fully carry out his intentions, and in order that the dental profession might secure to the fullest extent possible the benefits in an educational way which it was the expressed purpose and intent of Dr. Evans that the dental profession should receive from his benefaction, a co-operative affiliation was arranged and agreed upon between the trustees of

the Evans estate and the trustees of the University of Pennsylvania whereby the resources of both institutions might be practically utilized for the common purpose which both corporations had in view. As an outgrowth of the affiliated activities of the two corporations the educational institution known as The Thomas W. Evans Museum and Dental Institute has been erected at Fortieth and Spruce sts., Philadelphia, in which ample provision has been made for the carrying on of three correlated departments of dental education. First, an undergraduate school for the training of dental students in preparation for the degree of Doctor of Dental Surgery; second, a department of postgraduate instruction equipped for the advanced training of qualified dental practitioners in subjects relating to dentistry upon an elective basis; and third, provision for original scientific investigation open to those fitted to engage in research work under the guidance of competent teachers and with the facilities of the Institute at their disposal.

The building and its equipment represent a pecuniary outlay approximating nine hundred thousand dollars. Its installation has been designed and selected with reference to the scope and character of the educational plan, which embraces in general every recognized phase of dental activity, but the material features of the Institute are the outgrowth of and dependent upon the *motif* or principle which is the foundation of its educational plan, viz. that its educational work shall be conducted in harmony with the scientific spirit—that not only its research work, but its undergraduate instruction, shall be rational and not empirical.

On the 22d of February the Evans Institute was formally dedicated to its educational purposes. The trustees, officers of instruction, delegates, invited guests, and students formed in academic procession and proceeded to the Institute building and to the clinical operating room, in which the fifteen hundred persons constituting the audience were seated. After an invocation by the Rev. Joseph Wilson Cochran, and the singing of the National anthem by the audience, the president of the Thomas W. Evans Museum and Institute Society, Hon. John Weaver, made a brief opening address, and then introduced in succession Mr. John Howard Mummery of London, Eng., Prof. Wm. Simon of the Baltimore College of Dental Surgery, and Dr. Edward C. Kirk of the University of Pennsylvania, each of whom delivered an address. Mr. John T. Windrim, architect of the Institute, then

formally presented the key of the Institute to President John Weaver, who accepted the key on behalf of the Thomas W. Evans Museum and Institute Society, and then presented the key to Dr. Edgar F. Smith, Provost of the University of Pennsylvania, who accepted the key on behalf of the University; after which the following were called upon to receive academic honors at the hands of the Provost of the University on behalf of its board of trustees:

Mr. John T. Windrim, architect of the Evans Institute, to receive the degree of Master of Science in Architecture.

William Simon, Truman William Brophy, Edward Hartley Angle, Eugene Solomon Talbot, John Howard Mummery, Edouard Charles Godon, Wilhelm Dieck, Greene Vardiman Black, for the honorary degree of Doctor of Science.

Edwin Tyler Darby, Edward Cameron Kirk, for the honorary degree of Doctor of Laws.

It had been hoped and expected that both Prof. Dr. Wilhelm Dieck of the Dental Institute of the University of Berlin and Dr. Charles Godon of l'École Dentaire de Paris would have been able to be present and to receive their degrees in person, but owing to the exigencies arising out of the European war, neither was able to be absent from his post of duty. The degrees in these cases, as well as in the case of Dr. G. V. Black, who was unable to be present on account of ill health, were conferred *in absentia*.

After the singing of "Hail Pennsylvania!" by the audience, the benediction was pronounced by the Rev. Joseph Wilson Cochran, and an inspection of the new building was made. The day following the formal dedication a demonstration of the activities of the Institute and its clinical facilities was given; sixty-three clinical demonstrations were made in the large clinical operating room of the Institute. The dedicatory exercises closed with a banquet under the auspices of the Dental Alumni Society, held in the old Dental Hall of the University, which had been the home of the dental school for eighteen years.

The dedication of the Evans Institute is not to be considered merely as the inauguration of a new dental school, or the rehabilitation of an old one. It is in a very large sense to be understood as the launching of a new educational enterprise. It is the expression of an earnest effort not only to reflect in a practical way the intent and purposes of its benefactor and an educational demand of modern dentistry, but also to provide for its future

development upon a broad scientific basis. As an indication of the growing importance and the breadth of relationship which dentistry now enjoys, the Evans Institute must be regarded as the expression of one of those forward steps which in the domain of dental education is the analog of that splendid example of the relationship of dentistry to public health service embodied in the materialization of the benefaction of the brothers Forsyth in the Forsyth Dental Infirmary for Children in Boston.

Legitimate Practice and the Harrison Anti-Narcotic Law.

We are officially advised that the Commissioner of Internal Revenue has ruled that the term "legitimate practice of his profession," as used in the Harrison Anti-Narcotic Law, requires that a physician, dentist, or veterinary surgeon in order to register under the provisions of this law must have complied with all of the laws of the state in which such physician, dentist, or veterinary surgeon resides.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Journal of the American Medical Association*, Chicago, January 20 and February 13, 1915.]

ENDAMŒBIC PYORRHEA AND ITS COMPLICATIONS: A PRELIMINARY NOTE. By Dr. J. S. Evans and Dr. W. S. Middleton, Madison, Wis.

PYORRHEA DENTALIS AND ALVEOLARIS. SPECIFIC CAUSE AND TREATMENT. By Dr. C. C. Bass and Dr. F. M. Johns, New Orleans.

ENDAMŒBAS AND PUS POCKETS ABOUT THE TEETH. Editorial.

[*American Journal of Clinical Medicine*, Chicago, January 1915.]

EMETIN IN PYORRHEA. By Dr. J. R. Ricker, Houston, Texas.

[*Items of Interest*, New York, February 1915.]

AMŒBÆ IN PYORRHEAL POCKETS. By Dr. C. E. Kells, New Orleans.

[*Oral Health*, Toronto, February 1915.]

EMETIN TREATMENT OF PYORRHEA ALVEOLARIS. By Dr. G. R. Harrison, Richmond, Va.

[*American Journal of Clinical Medicine*, Chicago, March 1915.]

THE PHYSIOLOGIC ACTION OF EMETIN HYDROCHLORID. By Carl Nielsen, Chicago.

WILL EMETIN CURE PSORIASIS? Editorial.

IRRITATION FROM EMETIN. By Dr. E. F. Bowers, New York City.

Evans and Middleton preface their article with a careful summary of the various steps which have led to the discovery of endamœba buccalis as the specific exciter and emetin hydrochlorid as the specific drug for the treatment of pyorrhea alveolaris, noting with most highly commendable accuracy the publications whence their information is derived

—which, unfortunately, is not a general habit of dental writers. Among the accessories to and refinements of emetin administration enumerated by them, those which have not been mentioned in these columns are the use of air pressure to separate the gums from the tooth, suggested by Dr. S. H. Chase; the use of blunt-pointed needles indicated by Dr. Kent Wood; and the replacement of the hypodermic needle by a dental file suggested by Dr. E. J. Hart—the hanging drop of emetin solution adapting itself by capillarity to the smallest pockets, where no needle could be introduced.

The present study constitues a brief preliminary report of a series of cases under observation in the University of Wisconsin medical clinic. In all, seventy-two oral cases have been examined by the usual method—heated stage, warm slide, and cover-slip, the material scraped from the depth of the pocket being immediately mixed with warm normal salt solution and mounted. Seventy cases showed endamœbæ ranging in size from 8 to 32 microns in diameter, filled with granular material, but no contractile vacuoles; the pseudopodia varied widely in size, length, and activity; the ectoplasm was decidedly hyaline, and only after an interval was there an outpouring of the granular endoplasm into the newly formed hyaline pseudopod. These amœbæ fall under the heading of *endamœba gingivalis* of Gros (1849). The type of *endamœba kartulisi* of Doeflein (1901) was associated with the endamœba gingivalis in two cases. An unclassified amœba was noted in two cases of pernicious anemia along with the type gingivalis. The two negative cases showed considerable gum retraction with dentinal erosion.

Evans and Middleton attach considerable importance to the mechanical interference by metallic fillings, crowns, or plate attachments with the normal adaptation between the cementum and the circular ligament; these appliances, if constructed faultily, are a frequent source of pyorrhea, as every dentist knows, or should know. Of the seventy pyorrhea cases with amœbæ present, fifty-four were treated by the local injection of 0.5 per cent. emetin hydrochlorid solution. The results were practically uniform in the marked improvement of the pyorrhea. The period of treatment varied from four to twelve days, with an average of about seven. In a few instances the patients complained of tender gums, but the great majority remarked early in the course of the treatment on the new experience of an ability to brush their teeth without the pain or the bleeding noted prior to the treatment. After an interval of from several days to a week following the last treatment, which corresponds to an apparent local cure, a re-examination for amœbæ was made. Even though the second examination was negative, as a precautionary measure a subcutaneous course of emetin was instituted. Two plans of dosage were followed: A series of small doses, 1/8 grain daily doses of the hydrochlorid for eight days, or a shorter series of larger doses, ½ grain repeated with a day intervening, followed by ¼ grain on two successive days. The reason for this supplementary treatment has been to insure the death of any endamœbæ penetrating the deeper tissues of the gums, and therefore possibly unscathed by the local injections. Another rational procedure would be periodic subcutaneous injections, at monthly intervals, for a period of several months, to prevent the multiplication of encysted amœbæ which resist the biochemical amœbicidal action of ipecac. Only five cases have been treated by these writers with subcutaneous injections alone. The results in these have been entirely satisfactory, but with ambulatory cases they have not felt justified in using the rather large doses suggested by Bass and Johns. In regard to local reaction on the subcutaneous injection of emetin hydrochlorid, in some cases a wide indurated areola of inflammation about the point of injection has been noted following the third or fourth dose of only ¼ grain, sometimes attended by a temporary exacerbation of the general symptoms, usually followed by a marked improvement. This reaction they consider as an index of a point of saturation, when, with the death of numerous amœbæ, the strength of emetin in the blood having reached a lethal point, a great amount of bacterial and possibly amœbic toxin is liberated.

In regard to the exact method of action of either toxin, we may assume the selective action of the specific toxins to determine the system or the structure involved. The liver is to a great degree responsible for the disposal, breaking up, or removal of toxins arising within the body. It is therefore barely possible that certain of the systemic dis-

orders may arise from a disturbance of the normal metabolic function of the liver. As to hemic complications, the degrees of secondary anemia noted by these writers might readily arise from a bacterial hemolytic toxin, but their observations on the active lysis of engulfed red corpuscles in numerous instances lead them to the belief that the endamœbæ, either through an intracellular or extracellular hemolytic toxin, or both, may be even a more important factor.

In conclusion, they would impress the facts that constitutional disturbances are very frequent complications of endamœbic pyorrhea; that arthritis, particularly of the type of arthritis deformans, is the most frequent complicating disorder, and that the results from the local and general administration of emetin hydrochlorid in the relief of the pyorrhea and the marked improvement of the arthritic condition are very encouraging in a large percentage of cases. In addition, unexpected relations between pyorrhea and certain remote conditions are established through the response to the emetin treatment.

Bass and Johns, following up their inaugural article on "The Cause and Cure of Pyorrhea Alveolaris" (see review in DENTAL COSMOS, February 1915, p. 223) present a very extensive paper on the technique of obtaining the material for microscopic examination, the method of staining the slides and identifying the endamœbæ in pyorrhea dentalis and alveolaris, and give a description of the disease and the manner in which it is produced, and their manner of treatment, at the same time offering a liberal number of beautiful photomicrographs which are by far the best that have as yet been published in this connection. The summary of their findings is that pyorrhea dentalis and alveolaris is practically a universal disease, which leads to the loss of the teeth by a long suppurating process. All people have it sooner or later. It begins in early adult life or earlier. The specific cause of the disease is endamœba buccalis and possibly other species, which infect and destroy the peridental membrane. The pyorrhea results largely from the secondary infection. The demonstrable endamœbæ can be destroyed by giving ½ grain of emetin hydrochlorid hypodermically for three to six successive days. Apparently equal endamœbicidal effect is produced by two or three Alcresta ipecac tablets (Lilly) taken by the mouth three times a day for four to six successive days. The lesions require variable lengths of time to heal, but many could not reasonably be expected to heal in less than several weeks or months. The treatment must be repeated from time to time until the lesions all heal, on account of relapse, or probable reinfection of the lesions as a result of the great prevalence of the infection. Injecting ipecac or emetin into the worst lesions ought to be of service and can be carried out by patients in many instances. Rinsing the mouth thoroughly with a solution of fluid extract of ipecac is believed to protect, to some extent, against reinfection, and actually cures the disease in its earliest stage in some instances.

In the same number, the *Journal* editorially comments on the recent articles by Barrett, Smith, Bass and Johns, Evans, Middleton, and others, and emphasizes the need of cooperation between the physician and dentist and better knowledge by each of the field of the other, saying that the dentist has not usually been trained to recognize or appreciate the danger of these chronic suppurations to the general health, and the physician, including perhaps the bacteriologist, has not made a sufficiently close study of the tissues involved in these suppurations to enable him to draw proper conclusions, especially with reference to the complete cure of such cases, under the most favorable treatment imaginable. After discussing the nature of the dental and adjacent tissues, their structure and functions, and their mode of involvement by pyorrhea alveolaris, the *Journal* remarks that, on account of these conditions, the word "cure" should be used with caution. Evidently some of those who have been studying these cases have considered them cured when no more endamœbæ were demonstrable, apparently without considering the tissue changes and conditions which would prevent the closure of the pocket. A case should not be considered cured while there remains the constant irritant—the denuded cementum—which maintains the harbor for a reinfection. This fact seems already partially recognized in the above report of Bass and Johns, as they state that reinfection has occurred in about 12 per cent. of cases within four weeks.

It is also stated that a previous injury or inflammation seems necessary "to furnish a kind of pocket" in order to provide a nidus

for the endamœbæ, and that they are not known to live on open surfaces. These statements should impress on both dentist and physician the possibilities of greater watchfulness of the gingivæ, and more careful management of operative procedures to prevent the injury which prepares the pocket for the endamœbæ. The pus pocket is always preceded by a gingivitis which may be so insidious as scarcely to attract the patient's attention. Most cases may be cured by very simple procedures, if undertaken previous to the detachment of the tissue from the root.

Ricker uses emetin hydrochlorid, hypodermically, injecting into the subcutaneous cellular tissue ½ grain daily for three successive days, then every fourth day until the gums are entirely healed and the teeth tight. He also employs emetin locally to the pockets and walls of the pockets by means of a syringe, using a ½ per cent. solution. Oral hygiene by the patient is insisted on, the mouth to be washed after every meal with a good antiseptic wash, followed by a few drops of fluid extract of ipecac, applied to the gums and teeth by means of the tooth-brush. Instrumentation is absolutely necessary, consisting in scaling of tartar, removal of ill-fitting bridges and crowns, and the polishing of projecting fillings, before starting the emetin treatment. He reports a great saving of time and apparently permanent cures.

Kells insists that the dentist must learn to recognize amœbæ, if necessary, by taking lessons from a bacteriologist; else slides must be made and sent to a laboratory for diagnosis. He prefers Bass' method of injecting emetin hydrochlorid hypodermatically in the arm, and emphasizes the necessity of sterility of the syringe, solution, and field of injection. His method of treatment is as follows: If, upon examination of the mouth, pyorrhea is either suspected or recognized, a microscopic examination is determined upon. A note is made from around which teeth the scrapings are to be taken, and a microscopic glass slide is prepared accordingly, the symbols of the teeth from which scrapings are to be taken being etched on the slide with a small pointed carborundum stone, so that they are indelible. The positive or negative result of the microscopic examination of the slide is also marked thereon by the same means with plus or minus symbols, and the slide is preserved for the sake of record.

Scrapings are taken from the pockets, recorded, and smeared very thinly opposite their respective symbols. These scrapings should be taken from the bottoms of the pockets, and should be as free from blood as possible. Sometimes a toothpick properly trimmed, at other times Younger scalers, are used for this purpose. The patient's name and the number of the slide are then recorded on a sheet prepared for the purpose, and kept in a loose-leaf daybook.

An immediate examination of the slide may be made for the live amœbæ, but as time may usually be much better employed than in such search while the patient is in the chair, the slide is immediately properly heated to fix the specimens. At convenience the slide is stained and a microscopic examination is made, the result being recorded in the book. If the examination proves negative, assuming that it might be through error in technique, at the next sitting a duplicate is made. Every effort must be made to recognize positively the amœbæ. If the case is a bad one, one half-grain emetin hydrochlorid in 1 cc. of distilled water is injected in the left arm near the shoulder, for three successive days. Unless the solution is freshly made, and therefore warm, the syringe should be heated by being well rinsed with boiling distilled water, which will in turn warm the emetin to the proper temperature for injecting. Only fresh solutions should be used, which are readily made by dissolving one tablet in 1 cc. of distilled water at the time of use, or, if well taken care of, sufficient solution for three days can be prepared at once. In some cases, slight soreness of the arm follows the injection.

If the disease is limited apparently to one or two teeth only, instead of giving the hypodermic of emetin, one bottle of forty tablets of ipecac, which does not dissolve in the stomach, is prescribed, three to be taken twice daily after meals. The patient is instructed to put two drops of fluid extract of ipecac in a small quantity of water and to rinse the mouth most thoroughly immediately before retiring, after the teeth have been properly brushed and cared for. After the lapse of about one month a second microscopic examination is made. If amœbæ are found, a second series of emetin is injected. Kells fittingly points out that "This treatment will not bring the dead to life,"

but that it justifies the hope that, if used in time, it will prevent the ravages of the disease.

Harrison, in *Oral Health*, confirms the findings and technique of the previously mentioned writers, and makes a plea for accurate case histories in co-operation with the research work in this field so far accomplished. He is personally making blood and urine examinations in his cases, with the hope of establishing valuable data. In the examination of cases he condemns pressing of the soft tissue over the pyorrheal pockets.

In its March issue, the *American Journal of Clinical Medicine* gives what practically amounts to a symposium on emetin in various fields of application, as in bronchitis and tuberculosis, in controlling hemorrhage following naso-pharyngeal operations and gunshot wounds of the chest, in pellagra, and in dysentery. A most meritorious investigation is that of Nielsen on the physiologic action of emetin hydrochlorid, illustrated by excellent tracings. His conclusions are that the hemostatic action of emetin hydrochlorid in therapeutic doses is a consequence of its vaso-constrictor properties, confined to the capillary circulatory system, in conjunction with a decrease of the rate of the heartbeat produced at the same time. Apparently it does not influence either the physical composition or the coagulability of the blood. In toxic doses it causes increased salivation, nausea, vomiting, slowing of pulse, decrease of temperature, and muscular weakness. In lethal doses it produces central paralysis and arrests the heart in diastole. The vomiting produced by toxic doses is due to local irritation of the gastric mucous membrane. The results obtained with pregnant and non-pregnant uteri in guinea-pigs seem to indicate that the action of emetin hydrochlorid in this organ is not of therapeutic importance.

Commenting on Dr. Wm. R. Chapin's experience of a cure of psoriasis following emetin treatment of pyorrhea alveolaris, published in February Cosmos 1915, p. 189, *Clinical Medicine* says that psoriasis may prove to be a disease of amœbic origin, and research workers should be encouraged to study this disease anew with this thought in mind. Probably the best results could be secured by injecting emetin hydrochlorid hypodermically in ½ to 1 grain doses. Since psoriasis is one of the most common of all skin diseases, there should be no lack of clinical material.

To avoid irritation from hypodermic injections of emetin, Bowers suggests injecting first into one arm, then into the other, alternately. To avoid the occasionally quite severe reaction following the introduction of emetin into pyorrhea pockets, *Clinical Medicine* advises the use of very weak solutions initially, to be carried not too deeply into the surrounding inflamed tissue. In the beginning of treatment a blunt-pointed hypodermic needle should be employed and the pocket simply be flooded with the solution, no effort being made to penetrate the tissues.

The wealth of material which is being offered in current dental and medical literature in regard to emetin hydrochlorid, which bids fair to assume the nature almost of a panacea, is surely gratifying, and it is to be hoped that the sanguine expectations attaching thereto will not be disappointed.

[*La Revue de Stomatologie*, Paris, April 1914.]

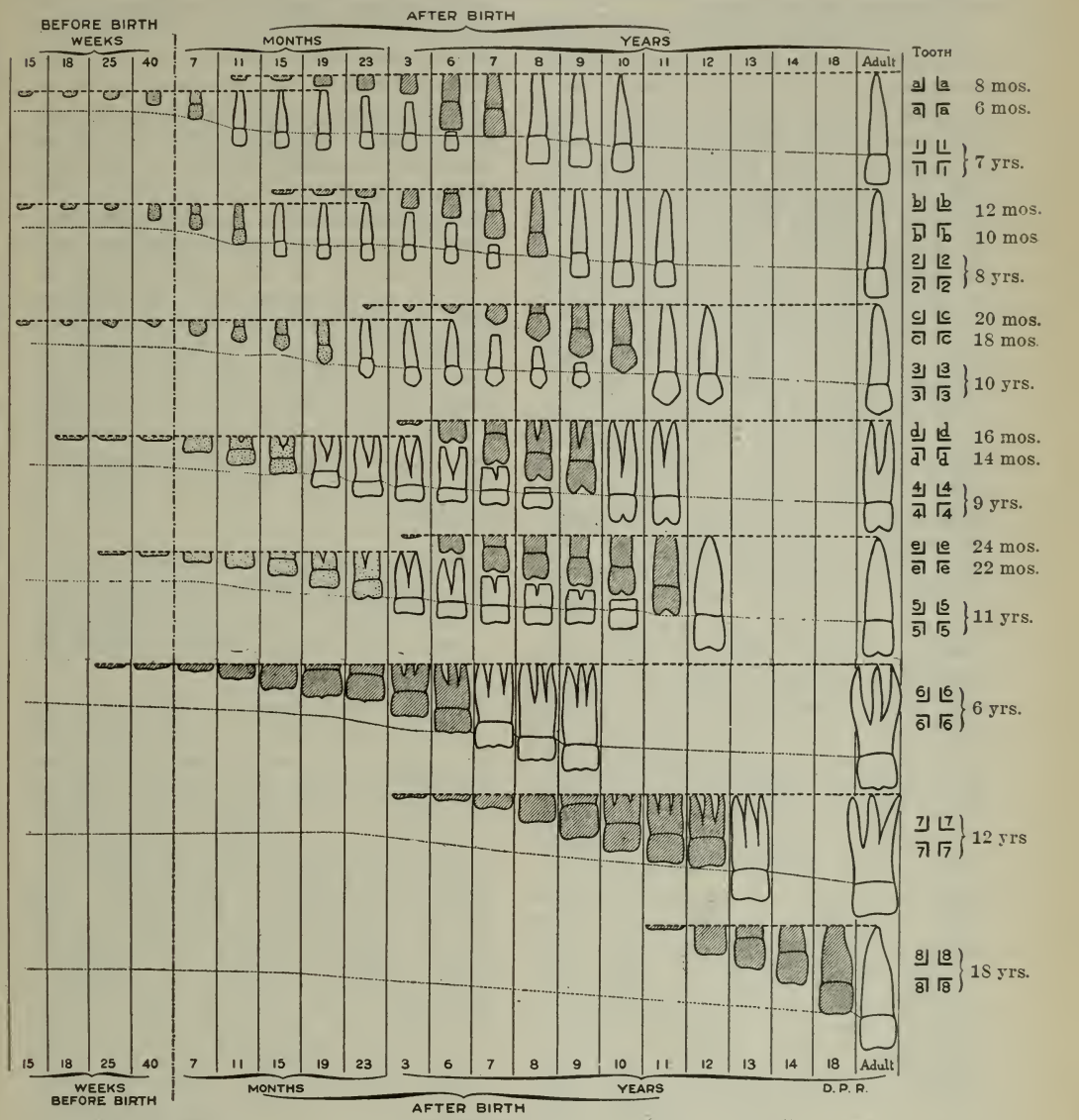
CHRONOLOGICAL TABLE OF THE DEVELOPMENT OF THE DECIDUOUS AND PERMANENT TEETH. By Dr. Pierre Robin.

Since Dr. C. N. Peirce published in the Dental Cosmos for August 1884 his table on "Calcification and Decalcification of the Teeth," which has since made the rounds of dental text-books, no effort has been made, as far as we know, to present in a convenient diagram the different phases of development, eruption, and absorption of the deciduous and the permanent teeth. Such a table permits of information at a glance during clinical examination, and Dr. Robin's diagram therefore is of great value.

The table is divided into two zones by a vertical line of dots and dashes—the zone on the left of this line corresponding to the period before birth, the zone on the right of it to the period after birth. Each of these zones is itself divided by continuous vertical lines which represent the periods in which the observations were made. Before birth, the time is reckoned in weeks, after birth up to the twenty-third month, in months, and after three years, in years.

In each horizontal field are represented all

Dates of Eruption of the Deciduous and Permanent Dentitions. (*By Dr. Pierre Robin.*)



The follicular period of deciduous teeth shown by dotted area; that of permanent teeth by lined area.

Average period of eruption of teeth {
- Deciduous teeth (in pairs) every two months, starting at six months.
- Successional permanent teeth, every year, starting at seven years.
- Remaining permanent teeth, every six years, starting at the sixth year.

Remarks.

(1) The development of the teeth is regular and continuous.
(2) In development, the tooth does not force its root into the jaw.
(3) The papilla, from which the tooth develops, remains fixed, as a centre, around which the tooth grows in length and the jaw in size.
(4) The dates in the table are the mean of those at which the upper and lower teeth erupt.
(5) In each jaw, teeth of the same name are symmetrically arranged on the right and left sides, and usually erupt simultaneously.
(6) The eruption of the temporary teeth in the lower jaw precedes, as a general rule, that of the corresponding upper teeth by two months.

the stages of evolution of a deciduous tooth and its permanent successor.

The intra-follicular period of development of each tooth is represented diagrammatically in stippling for the deciduous teeth, and in cross-line shading for the permanent teeth. This phase of the development is placed above the dotted line which represents the gingival margin. The follicular period ceases when the tooth perforates its follicle and makes its appearance at the gum margin, represented by the dotted line. As soon as this takes place, the development is extra-follicular, and the teeth are now represented in plain-line diagrams. When the neck of the tooth reaches the gum margin, its eruption is complete.

The extremity of the root occupies during the development of the tooth the base of the dental papilla, and the development of the roots is usually followed by that of the alveolar process and jaws, as the eruption of the deciduous and permanent teeth takes place. This explains the apparent contradiction of the forcing of the root into the body of the jaw. The dental papilla must be considered as a center. These papillary centers constitute a line around which the jaws develop in an eccentric manner. The gingival edge, therefore, diverges progressively until adult age from these papillary centers, which in the table are represented by the line of dashes. This explains why the gingival border —dotted line—describes a curve which diverges from the papillary centers in the permanent as well as in the deciduous dentitions, from the beginning of calcification of the enamel organ until adult age. This curve, co-ordinating the age and the length of the root, indicates in a very exact manner the increase in the size of the jaw. This growth takes place in every direction around the papillary centers, in the bucco-lingual, mesio-distal, and vertical planes. In this latter direction it is chiefly the lengthening of the alveolar process which contributes to the increasing distance between the gingival margin and the papillary centers—a phenomenon which is particularly well shown in the table.

At a glance, the beginning of calcification of each follicle, and the advance in development of the tooth is very easily seen for any age, and the absorption of the deciduous teeth and the development of the permanent ones is equally easily calculated. The location of any hypoplasia observed on deciduous or permanent teeth enables one to determine the age at which these lesions arose. By questioning the patient or parents it can be ascertained whether such hypoplasia was contemporaneous with any other phenomena which may have played a part in producing the tissue lesions.

Early extraction of deciduous teeth may often be deferred when the prospective date of their loss can be fixed. The operator appreciates that by taking care of the deciduous teeth the child will profit by their prolonged masticatory function. All caries which appears in a deciduous tooth more than two months before it should be lost normally, must be treated, such treatment preventing pain, abscess, indigestion, gastro-intestinal intoxication, and maxillary and facial deformities.

[*La Stomatologia*, Milan, April 8, 1914.]

THE EFFECTS OF STIMULATION OF THE DENTAL PULP UPON RESPIRATION AND CIRCULATION. By Prof. Dr. A. Arlotta.

Arlotta demonstrates the results of his interesting experiments concerning the effects of thermal and electric stimulation of the pulp and the dental nerves upon circulation and respiration by a series of record charts, which lead to the following conclusions:

Electric or thermal (cold) stimulation of the dental pulp produces a reflex action upon respiration, consisting in a diminution of the rate of respiration. The expiratory phase is notably prolonged, confirming the influence of stimulation of the trifacial nerve upon expiration. In the majority of cases no reflex action of pulp stimulation upon the cardio-vascular system is noted. Stimulation of the mental nerve trunk produces the same marked effects upon circulation and respiration as stimulation of the central root of any other sensory nerve trunk.

While these findings are important from a scientific point of view, the writer does not claim any practical value for them to the extent that pulp treatment in patients with pathological alterations in their circulatory or respiratory system is contra-indicated, especially if the infliction of pain in the pulp is eliminated by suitable means.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

Section I.—*Dental Anatomy, Histology, and Physiology.*

THE BEARING OF A THEORY OF MAXIMUM SHEAR ON THE MECHANISM OF MASTICATION IN MAN. By D. M. Shaw, London, Eng.

Tooth forms and jaw movements are found to be dominantly adapted for *shearing*—not compression—stresses, contrary to views expressed in current text-books on anatomy and occlusion. (See *Dental Record*, vol. xxix, p. 453, and vol. xxxii, p. 613.)

Overlap and sharpness, which make shearing obvious in incisors, are both present also in buccal teeth. Internal cusps are needed to help the tongue in holding food in position for finer reduction. Degree of reduction plus nature of food are the governing conditions in mechanism "design."

A working diagram was shown of normal chewing stroke or cycle; the position of maximum shear coincides with maximum food-strain.

Following cusp wear, jaw movements are always definitely modified to secure the optimum shear available.

In phylogeny, the lingual cusp evolves by acquiring progressively three different utilities: (1) Small surface modification shielding the gum by deflecting hard food; (2) its development to food-holding—tongue-assisting—prominence; (3) further elevation to shearing and "crushing" utility, the "fifth" cusp in the lower first molar being an example.

The importance of optimum sharpness is illustrated by the discovery of the tongue-shielding "umbicle."

Section II.—*Dental Pathology and Bacteriology.*

PATHOLOGY AS INFLUENCED BY THE STUDY OF MALOCCLUSION OF THE TEETH. By Dr. Henry C. Ferris, New York, N. Y.

The writer maintains that the physician's attitude toward the physiological and pathological influence of the oral cavity is inconsistent and untenable.

He reports a physiological experiment upon a sixteen-year-old normal subject to show the reflex action through function upon the enzymic index, and notes a difference occurring between the molars and premolars.

There are three premises upon which the effects of malocclusion may be based: (1) Malocclusion due to congenital or hereditary tendencies; (2) malocclusion when the child is born normal, and the developmental forces are interfered with after birth—infectious diseases, traumatic injury, etc.; (3) malocclusion due to loss of function of the organ owing to environment, dietetic habit, or mutilation of the arches by extraction. The latter class being considered as a primary factor in disease.

The effects of different classes of malocclusion upon the system are considered, as follows: Circulatory system; respiratory system; digestive system; urinary organs; nervous system.

Repressive tissue changes involve the circulation of the blood, atrophy, degeneration, and necrosis.

Progressive tissue changes involve restoration of bone.

He discusses types of inflammation, plant parasites — bacteria micro-organisms — infectious diseases, malformations, and lesions.

He presents illustrations from practice—two cases, with slides, one of corrected acidosis, one of corrected chronic constipation—with quantitative physiological records, verified by a pathological laboratory medical and dental attendant.

Section III.—*Dental Surgery and Therapeutics.*

AN IDEAL CEMENT FOR STOPPING ROOT-CANALS. By Dr. Vincenzo Guerini, Naples, Italy.

An ideal cement for filling the root-canals can only be obtained by a method which permits of hermetically sealing the apical

foramen without leaving compressed air in the canal, and which is carried out with a substance not only antiseptic, but also free from irritating properties, so as to avoid the possibility of an apical periodontitis or even of an alveolar abscess.

The essayist's cement perfectly fulfils all these requirements. The paste made with it can be shaped in small, conical pinlike sticks, by rolling it between the finger and a suitable plate. One takes these small sticks with converging forceps or other suitable instrument and introduces them into the root-canal, reaching and filling the apical foramen and then compressing the cement in the canal cavity. In from ten to twelve minutes the cement is hardened, and one can proceed to fill the cavity at the same sitting. By the proper use of this cement no failures occur, and even in the cases where a previous apical periodontitis exists, this becomes cured.

ORAL SEPSIS—THE GENERAL EFFECTS UPON THE SYSTEM WHICH MAY BE ATTRIBUTED TO TOXEMIA OF ORAL ORIGIN. By Sir Rickman J. Godlee, Bart., Past President of the Royal College of Surgeons of England.

This report refers to the short time that has elapsed since the attention of the profession was directed to the question of the general effects on the system that may follow on the existence of oral sepsis. The essayist suggests that some caution is necessary in drawing deductions, and that there is a danger of mistaking mere coincidence for causation. Reference is made to the necessity for removing all sources of oral sepsis in certain conditions requiring surgical operation, and to the advisability of doing so in every case that comes under the care of the surgeon. An enumeration is made of the various diseases which have been supposed by different observers to have been caused by oral sepsis, and the verdict of the profession on this matter is very briefly discussed.

Section V.—*Dental Prosthesis.*

DETACHABLE GUM FACINGS. By Ernest Fogg, Newcastle-on-Tyne, Eng.

This paper is a description of a continuous-gum facing made detachable, and not subjected to heating, soldering, pressure in packing, or vulcanization. Continuous-gum work and its drawbacks, and gum blocks and their disadvantages, are discussed. Hitherto it has been impossible to obtain from the manufacturer anything in the nature of a continuous gum extending all around the mouth.

The method suggested is a detachable gum facing which is removed from the case just before the investing for soldering, or before the flasking for vulcanizing, afterward being replaced and cemented in position or otherwise held, and in connection with detachable teeth can be employed all around the mouth.

In practice the metal, wax, or other plate forming the foundation of the denture is first placed in position.

A gum facing of suitable size, shape, and color, is then selected and slightly oiled, and into the recesses therein detachable double-headed pins are fitted and the gum blocks are adjusted to the foundation, thus forming the gum line with the pins in position. Teeth of suitable stock, size, shape, and color are now adjusted at the required angle in the sockets provided in the gum facings, and both the blocks, pins, and teeth temporarily fixed in position by wax or suitable material.

The gum blocks are now removed, leaving the pins embedded in the wax and the teeth in position on the model, or, if detachable teeth are used, their supports.

The work is now ready for flasking, casting, soldering, or other treatment. The plaster is carefully manipulated around the exposed parts of the pins and the bed of wax or metal which is to form the bed for the gum blocks, and if the teeth are to be received in the first part of the flask, around and over the teeth. The plaster is then greased in the usual way, and the second half of the flask run in.

The parts of the flask are now separated and the wax or other material boiled out, and the work packed and vulcanized, or, if the work is to be soldered, plaster investments are employed in the customary way, the work is removed from the flask or investment, trimmed up, and polished.

The gum blocks are now placed in position upon the half portions of the pins which project from the vulcanite or other material employed, being received in the recesses in the backs of the gum blocks. The gum blocks rest around the necks of the teeth, and are

retained there by suitable cement or other medium, screws, etc.

The gum blocks are formed to go between, and to receive one, two, or any desired number of teeth.

Section VI.—*Orthodontics.*

THE INFLUENCE OF INTERNAL SECRETIONS IN REGULATING THE GROWTH OF THE JAWS. By Arthur Keith, M.D., Conservator of the Museum and Hunterian Professor, Royal College of Surgeons of England.

The essayist gave, in the first place, an epidiascopic demonstration of the changes which affect the masticatory system in acromegaly, founded on a study of six cases. The skulls of these were shown. He tends to prove that all of the changes in acromegaly are due to a reawakening of growth processes which normally cease at the end of adolescence. To explain the phenomena of acromegaly it is necessary to suppose that the anterior part of the pituitary body can exercise a direct influence on the growth of the skeleton. It must also be supposed that this influence is operative during normal growth, as well as in abnormal growth, and that through an internal secretion or hormone, the pituitary can sensitize the osteoblasts of the jaws, and thus can regulate the growth of these parts.

In support of this thesis, the reporter exhibited the skeleton of a boy of eighteen years, showing the condition which Mr. Hastings Gilford has named progeria. The condition is the opposite of acromegaly. Those parts of the skeleton which in acromegaly are overgrown are here markedly undeveloped. This is particularly true of the jaws and apparatus of mastication. The condition of the pituitary in progeria is unknown, but it is clear that, if we explain acromegaly as due to the condition of hyperpituitarism, we must regard progeria as due to one of hypopituitarism.

The essayist drew attention to the growth changes to be seen in the facial development of cretins and cretinoid cases of achondroplasia. These changes affect bones which are developed in cartilage or in membrane overlying cartilage. The only explanation which can be offered by the facial and other skeletal changes in cretinoid cases is that they are due to a defective action or secretion of the thyroid gland. The facial changes which result from defects of the thyroid are totally different from those ascribed to a defective action of the pituitary.

The essayist showed a case in which the hypertrophy is confined to the maxillæ, teeth, and apparatus of mastication of the right half of the head, the parts of the left side being normal. Such cases must modify our explanation of cases of generalized hypertrophy, such as acromegaly. In cases where all the tissues and parts of the body undergo an abnormal growth, we are tempted to suppose that some hormone or internal secretion, which normally stimulates growing tissues, is thrown into the circulation to an excessive amount. Such an explanation breaks down when applied to cases of local hypertrophy. We have to fall back on a more complicated explanation—one which supposes that growth and hypertrophy are due to the interaction of at least two factors. Dr. T. R. Elliott found that adrenalin, in causing a tonic contraction of the non-striated musculature, acted neither on the nerve fibers nor on the muscle fibers, but on a substance or element interposed between them. Adrenalin is an internal secretion or hormone, and it is legitimate to infer that the hormones which stimulate or regulate growth may act not directly on the tissues but on an element interposed between nerve terminals and the growing cells. Hypertrophy might be due to a change either in the hormone or in the "interposed" element. In localized cases the hypertrophy is evidently due to a change in the interposed element; in generalized cases, to a change in kind or in amount of the internal secretion. The occurrence of localized cases thus does not invalidate the explanation offered for acromegaly, viz, that it results from a condition of hyperpituitarism.

Castration has a direct effect on the development of the skeleton, including the jaws and apparatus of mastication. Removal of the testes causes a structural change in the pituitary, and it may be through the pituitary that the testicles react on development. Cases of defective growth of the maxillæ in eunuchoid individuals have been recorded.

No experimental proof is brought forward of the thesis maintained by the reporter that the growth of the palate, mandible, face, and apparatus of mastication is regulated by internal secretions. It is manifestly very diffi-

cult to design or carry out experiments which will effect a slight increase or decrease in the normal action of one of the glands of internal secretion. On the other hand, diseases of the pituitary or the thyroid do occur, and when they are studied they afford evidence that they exercise a direct influence in the development and growth of the bones.

Further, the essayist is of opinion that an explanation of the kind put forward is needed to account for the phenomena of normal maxillary growth and tooth eruption. For the proper and orderly eruption of the teeth it is necessary that the development and growth of the lower and upper jaws be accurately co-ordinated. In each there is an army of osteoblasts; it is patent that the armies must work in harmony to get effective results. To get that harmony we must postulate a co-ordinating mechanism, such as that put forward in this paper.

THE ANATOMICAL PRINCIPLES OF THE ORTHOPÆDIC ARRANGEMENTS OF THE JAWS ACCORDING TO PERSONAL INVESTIGATION. By Schroeder-Benseler, Cassel, Germany.

The orthopedic arrangements of the jaws as regards their scientific consideration and classification, from the standpoint of etiology and treatment, should be treated separately from orthodontics.

To discover the causes and consequences of irregularities of the jaws and teeth it will be absolutely necessary to observe a great many skulls, and also to examine clinical cases.

The foundation of all this investigation is the normal occlusion. It is necessary to question the normal bite and the value of the measurements of the breadth and height of the upper jaw. The relation of the osseous formation and the architecture of the upper jaw to normal occlusion is of great importance, especially the measurements of the breadth in the interior of the nose. On this basis we are able to arrange the orthopedic treatment of the jaws in order to obtain perfectly unrestrained nasal breathing.

A CRITICISM OF THE NEW SCHOOL OF ORTHODONTICS. By Wm. Rushton, L.D.S.Eng.

Orthodontic practitioners are divided into the "eclectic" school, which adopts any method, surgical, mechanical, or both, in the best interests of the patient, and the "new" school, as contained in Dr. Angle's work "Malocclusion," where the ideal insisted on is a full complement of teeth in normal relations.

The author sets forth the difference between the two schools, showing why, in his opinion, the tenets of the former are preferable to those of the latter.

The new school lays undue stress on malocclusion, and condemns extraction. Their operations are long, tedious, and dangerous to the tissues, and the results are often not so permanent nor so pleasing.

The eclectic school considers how utility and beauty can be secured at least cost of time, inconvenience, and danger. The practitioner may resort to extraction when he considers that rapidity, permanence, and superiority of results justify it. Malocclusion, if slight and not unsightly, is ignored, provided that the bite is functional. Reciprocal traction and artificial substitution of extracted teeth is deprecated.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

CYSTS OF DENTAL ORIGIN. By Dr. L. Widman, Stockholm, Sweden.

The essayist advocates the classification and terminology according to Louis Ombrédanne, who classifies cysts as follows: (1) Adamantine cysts; (2) follicular cysts; (3) paradental or periodontal cysts.

The first two named are developments originating from the tooth follicle, whereas the last named arise from a chronic inflammatory cause.

RESULTS OF THE OPERATIVE TREATMENT OF CLEFT PALATE. By H. Blakeway, M.S., F.R.S.C., London, Eng.

The chief aim of operative treatment is to produce a palate which is functionally perfect for the purpose of speech. In deciding to what extent this ideal is approached three main methods of operation have to be considered: (1) Operations aiming at median suture of the soft parts of the palate, especially Langenbeck's. (2) Lane's operation. (3) Brophy's method.

The results of Langenbeck's operation as performed by expert hands are known. It

is difficult to obtain sufficient information concerning Lane's and Brophy's methods.

The essayist compiles results of each of the three methods, with special reference to (*a*) mortality, (*b*) closure of the cleft, and (*c*) results as regards speech.

MYELOID SARCOMA OF THE JAWS. By Arthur W. W. Baker, M.D., F.R.C.S.I., M.Dent.Sc., Dublin, Ireland.

This communication deals chiefly with the report of a case of commencing myeloid sarcoma of the lower jaw in a young female, who was a patient attending the Dental Hospital of Ireland. The sarcoma completely disappeared without operation after removal of a portion of the growth for histological examination. The patient was seen in consultation by the late Professor Bennett, who agreed with the diagnosis, which was further confirmed by Dr. Earl, a pathologist, who prepared a section from the portion removed from the tumor.

SOME CLINICAL OBSERVATIONS OF REGENERATION OF THE MANDIBLE AFTER CARIES AND NECROSIS. By M. H. Cryer, M.D., D.D.S., Professor of Oral Surgery, University of Pennsylvania, Philadelphia.

There is considerable difference of opinion as to the agencies responsible for regeneration of the bone. The writer inclines to agree with Macewen that the growth of bone does not depend upon the periosteum. The growth of the mandible depends on an interstitial process which varies in different portions of the bone at different periods of life. The regeneration of new bone is brought about through the working of the osteogenic system in the bone remaining.

The writer discusses the causes of loss of mandibular bone by necrosis, and cites interesting cases, the earliest found being those of Percy of Paris in 1791, also others under his own observation. The periosteum is absent in many cases, having been lost by suppuration, but the great majority of them, when properly treated, recover without formation of sequestra. In severe cases sequestra are thrown off, but new bone is formed without loss of the contour of the face. A report is offered of cases in which new bone has been regenerated to fill up gaps or to reunite one segment of bone to another. The essayist gives illustrations, X-ray and others, of cases of varying etiology, such as tuberculosis, phosphorus poisoning, injections, use of hydrogen dioxid, and local septic conditions of the teeth.

Section VIII.—*Anesthesia, General and Local.*

IMPROVEMENTS IN LOCAL ANESTHESIA BY NOVOCAIN-SUPRARENIN. By Richard H. Riethmüller, Ph.D.Univ.Pa., D.D.S., Philadelphia, Pa.

The modified instrumentarium suggested consists of an automatic specimen jar with tightly clamped lid and porcelain stand—to avoid oxidation—which allows for suspension of two syringes and one pair of aluminum tweezers—to avoid disintegration by iodin—in a modified alcohol-glycerin solution; a glass tray with metal inset for resting sterile syringes and preventing accidental dulling and contamination of needles, and with a small covered tray for keeping needles, hubs, wrench and broaches in antiseptic solution; also a bacteria-proof stock flask for Ringer solution. A new safety irido-platinum needle is suggested, constructed on the principle of the Gates-Glidden drill, with weakest part near the hub to facilitate withdrawal of an accidentally broken needle, and adjustable safety ring to prevent disappearance of needle fragment in the tissues. The metal parts of the syringe in contact with the novocain solution should be enameled to avoid decomposition of the solution. Statement of date of manufacture of tablets should be insisted upon, as also tightness of rubber stoppers in tubes. Ampules should be tested in vacuum. The technique of injection should be practiced in green skulls and a dry skull in which the mucous membranes have been reproduced in wax up to the reflection. Colorless iodin solutions (iothion) are advocated for sterilizing the field of injection and the operator's palpating finger. The location of the mandibular foramen in mixed races, such as American, requires further anatomical study. Lancing of the gums before extractions, blood-pressure studies, external mandibular injection in ankylosis and infection, and the draining of the wound after apical root resection, are advocated.

PERISCOPE.

Thymol in the Treatment of Alveolar Abscess.—Thymol dissolved in oil of eucalyptus is very useful in the treatment of blind chronic alveolar abscess.—*La Odontología Colombiana.*

A Good Means for Disengaging Adhering Impressions.—If an impression sticks to the palate, the patient is requested to close the lips and to puff out the cheeks forcibly, which will separate the impression from the palate.—*La Odontología Colombiana.*

Investing Wax Models for Cast Gold Inlays.—Instead of using a fine brush to paint the investment on the wax model, the model is dipped in the investment, which by the use of a chip-blower or the breath is several times blown off. The cast will come out perfectly smooth.—E. W. FELLERS, *Nebr. Dental Journal.*

Controlling Hemorrhage after Extraction.—The method suggested, the efficacy of which the writer vouches for, though it would seem rather heroic, consists in filling the mouth full of common wheat flour, and having the patient close the mouth firmly enough to force the flour into the socket of the bleeding cavity and hold it there till a blood-clot is formed and the bleeding arrested.—W. L. MARCY, *Dental Digest.*

Polishing Celluloid.—Celluloid and kindred substances are best polished by rubbing with twilled muslin interwoven with paper, using as abrasive pumice with water, oil, or soft soap, or tripoli and oil. The smooth surface then is coated with soft soap and fullers' earth applied by the hand and rubbed until the soap disappears, leaving the desired polish. *Techn. Rundschau,* per *Deutsche Zahnärztl. Wochenschr.*

Method of Adjusting a Gold Inlay.—A quick and accurate method of adjusting a gold inlay, especially one of the large compound variety, consists in heating it to a dull red and then cooling it without dropping it into acid. The inlay is then inserted in the cavity with a slight rocking motion. Any prominent point will be indicated by a bright mark on the oxidized gold, indicating the points requiring relief.—*Oral Health.*

Hints on Soldering in Porcelain Work.—Borax must not be allowed to touch the porcelain. The investment is heated on each side and from below until the surfaces to be soldered are sufficiently hot to make the solder flow, at the same time making sure that the porcelain is hotter than the pins, and having perfect union of the parts to be united. If the solder flows to one side more than to the other, increase the heat of the investment on the sluggish side.—S. H. VOYLES, *La Odontología Argentina.*

Fetid Breath and Its Diagnostic Indications.—Of fetid odors, Dr. Hutchinson of London has indicated the following types: (1) Putrefactive type, as in cheese; (2) sulfureted hydrogen type, as in gangrene; (3) garlic type, as from arsenic or bismuth; (4) sweetish type, as in diabetics and beer drinkers; (5) toxic or hepatic types, as in biliousness and dyspepsias. But we can also recognize others, as (6) ammoniacal types, as found in urinary disorders; (7) acid types, as found in rheumatism; (8) aromatic types, as found after use of foods and drugs.

Different degrees of heat and moisture in the breath modify its odor. Odors also vary in intensity and pungency. Other distinctions are made but are difficult of application. In fine, it may be said that some of these substances baffle description, beggar language, and outrage our sensibilities.—T. W. CORWIN, *Items of Interest.*

Root Implantation, Physiological and Mechanical.—The writer's experiments made clear that, whereas metal was retained in the jaw-bone, the bone tissue did not take kindly to it. Roots denuded of peridental membrane were exfoliated. Autogenous and homogenous tooth-roots with peridental membrane upon them were retained. Alien tooth-roots not nursed upon the blood of the individual into whom they were transplanted were lost, except in one instance, where a sheep tooth-root was retained, but only mechanically. Alien grafts—tooth-roots—when nursed upon the blood of the individual into whom they were transplanted were retained. Powdered bone incorporated in vaselin, when introduced into tissue, invites calcarious de-

posits and the formation of new bone. Best of all, the possibility of transplanting alien tissue is no longer in doubt.—H. J. KAUFFER, *Items of Interest.*

The Philosophy of Prevention.—It is necessary in each community to give the widest possible publicity to the campaign for better health through sound teeth. Mothers must be taught how to preserve the teeth of infants; children be trained in the art of the tooth-brush, floss, and antiseptic wash; teachers prepared to impart the lessons of oral hygiene. The school curricula should include oral hygiene. Tooth-brush drills in schools are effective. Dental inspection, an effective system of follow-up to induce parents to have the teeth of their children cared for by the family dentist, the establishment of dental clinics for the free treatment of children whose parents are too poor to pay for private treatment—these are the foundation stones of health and efficient life, so far as oral hygiene is concerned.—E. F. BROWN, *Health News.* (N. Y. State Dep't. of Health.)

Convenient Oxygen.—The administration of gaseous oxygen, for anesthesia or therapeutically, may possibly in the future be facilitated by the provision of means for its ready evolution as wanted, instead of by cumbersome storage. Instead of using strong mechanical containers, chemical constraint can be substituted. Thus a commercial form of fused sodium peroxid called Oxone, with a specific gravity of 2.43, is a substance in which oxygen is held in chemical bonds, but is released by the application of water. A pound of this reagent holds 2.2 cubic feet of gas, or 60 liters of oxygen, at normal pressure and temperature. Thus a pound should furnish enough oxygen for thirty minutes of use. The oxygen evolved is said to be 99 to 100 per cent. pure, the only impurity consisting of a slight vapor caused by the energy of reaction. This is readily absorbed by passing the gas through water.—*British Dental Journal.*

Need of an Anesthetist at Any Operation under Anesthesia.—An inquest was held on Marie J. Van D., aged sixty-four, a Belgian refugee, who collapsed after extraction of two teeth under gas at the Southwestern Dental Dispensary. A qualified dentist and a female nurse were present at the time. The pathologist stated that death was due to the bursting of an aneurism of the brain. The fact that the woman had been given gas might have accelerated the rupture, but, on the other hand, it was an accident that might have happened at any time. That was the third case of rupture of an aneurism the pathologist had reported upon in the last ten days, and he stated that there were often no symptoms to be seen at all. No doctor could have told that this woman had one, and once it was ruptured, nothing could be done. In reply to the coroner, the patnologist said that he deprecated the practice of one man giving nitrous oxid and operating. In no other operation would one man do both. We cannot but feel sympathy for the dentist under his trying experience.—*Brit. Journ. of Dental Science.*

Osmium-platinum Alloy.—A new alloy, osmium-platinum, is the subject of a United States' patent. The rarer metals of the platinum group are not easily obtained in a state of purity, and therefore no great success has attended efforts to combine them as bivalent alloys. It is now stated that highly refined platinum and osmium have successfully been combined in widely varying proportions yielding alloys of commercial value. Alloys containing from 1 to 10 per cent. of osmium and from 99 to 90 per cent. of platinum are chiefly used. Great purity of the respective metals is essential to success, as even small percentages of other elements are very detrimental to the properties of the resulting alloy. One part of osmium in an alloy with platinum will take the place of two and one-half times its weight of iridium, and this is one of the metals hitherto most used. The new alloy is very resistent to acids, and also possesses great hardness and tensile strength. Wires of the finest caliber are drawn with comparative ease.—F. ZIMMERMAN, *Chem. Engineer,* per *Brit. Dental Journal.*

Mustard Oil in Odontalgia.—In a preliminary communication Adolf Schwarz states that he has accidentally come across a remarkable action of oleum sinapis æthereum—of the Austrian Pharmacopœia—on the sensory nerve endings of the trigeminal nerve. If a person suffering from toothache takes a small quantity of mustard oil in a bottle, and, after closing one nostril, inhales once the fumes of the oil, the first effect is a reddening of the face, flow of tears, and difficulty of respiration. Within a very short time all pain in connection with the tooth has disappeared. If he has inhaled too much vapor, respiratory reaction and the reaction to sneezing and to coughing are abolished, and the patient suffers some distress for the time. Provided that only one short inhalation is taken, the relief of pain is almost instantaneous and lasts for some hours. He has found that the pain of middle-ear disease can also be relieved by the same means, and is complete

enough to render the operation of paracentesis painless without any narcosis. The patient remains fully awake, and in no case is any unpleasant after-effect produced. He has carried it out in about sixty cases, including delicate women and decrepit old people.—*Muench. Med. Woch.*, per *British Dental Journal.*

Effect of Hydrogen Dioxid on Metals and Its Use in Sterilizing Instruments.—In the sterilization of dental instruments by chemical disinfectants, the heavy metal salts such as bichlorid of mercury are unsuitable because they attack the metal instruments. Other strong disinfectants are usually too toxic or impart a disagreeable odor to the instruments. Thymol, owing to its low degree of solubility, permits of only weak, hence ineffective solutions. The writer's experiments have shown that from 1 to 3 per cent. solutions of pure hydrogen dioxid (perhydrol) are most effectively bactericidal, and do not only not attack the instruments in the least, but even preserve iron objects, which show no change whatever when immersed therein for days, while in water they will rust after a few hours. To be sure, the hydrogen dioxid employed must be absolutely pure, for impure H_2O_2 preparations, such as the official hydrogenium peroxydatum medicinale 3 per cent., contains acid, and attacks iron very quickly. Hence the behavior of iron toward H_2O_2 preparations can be regarded as a test for the purity of the latter. The purity test of absolute H_2O_2 preparations is preferably made with copper.—W. Eichholz, *Medizinische Klinik*, per *Oesterreichische Zeitschr. f. Stomatologie.*

Suggestions for Crown and Bridge Work.—(1) Nearly all prosthetic castings should be made in combination with iridio-platinum or gold in wire or plate form as a means of reinforcement. (2) Iridio-platinum, on account of its great strength and freedom from oxidation, affords the best reinforcement. (3) 24-karat gold reinforced with iridio-platinum is the best for inlay abutments. (4) The reinforcement plan expedites as well as strengthens the work and obviates bulkiness, which it is in many instances so essential to do. (5) It is best not to heat any alloy of gold containing base metals to the point of oxidation when casting upon it. (6) It is unnecessary and detrimental to heat a flask to a red heat or anywhere near it when burning out wax. (7) The elastic limit of scrap or junk gold is practically *nil*, and it should not be used where much strain will be brought to bear upon it. (8) Alloys of gold with platinum will become very brittle when cast a few times. This, Dr. Taggart tells us, is due to contamination with silica contained in the investment. (9) The casting process makes possible the employment of almost all forms of porcelain teeth, and provision should be made for cementation rather than casting directly on to the porcelain. (10) Nearly all inlay abutments, regardless of size and shape of cavity, should have some form of supplemental pin anchorage.—F. E. Roach, *Dental Summary.*

External vs. Internal Incision in Alveolar Abscess.—One hears the opinion expressed that external incision for the evacuation of pus from alveolar abscess is never justified. The reason given is that it leaves a scar. I am of the opinion that a small linear scar is to be preferred to an ugly disfiguring scar which may result from permitting the pus to point on the face without surgical aid; besides, delay in discharging pus may result disastrously from general infection. The object of pus drainage is to lessen or prevent toxemia. Alveolar abscess is not without danger, and one is not justified in taking chances with his patients, especially if they may be avoided. In serious inflammation in the region of the angle of the mandible, accompanied by much swelling and trismus, pus is not easily evacuated into the mouth. Incision inside the mouth in such a case may not reach the pus, and even if it is reached, on account of the swelling it may be difficult to fully evacuate it and keep up the discharge. In such a case it is far safer to make an incision through the skin under the base of the jaw followed by blunt dissection until the pus is found. Gravity favors the discharge from such an incision, and drainage is more easily maintained. Pus, like water, drains best down hill. The scar of such an incision is linear and not easily observable. The one method is poor surgery, the other good surgery.—T. L. Gilmer, *Dental Review.*

Occupational Stigmata of the Teeth.—A few occupational dental stigmata have been known of old, notably in connection with various metals. With the modern advances in dentistry and in occupational diseases much has come to light. Some of the leading occupational stigmata which are of interest to the dentist are as follows: Confectioners are peculiarly subject to caries. The sugar dust forms oxalic acid in the mouth, and this attacks the exposed tooth to a uniform extent, as well as the root. In workers in hydrochloric acid, the enamel is attacked

and the dentin turns brown. Changes in the teeth are noticeable after the first three weeks of exposure; the teeth feel sore, and thence the entire crown disappears. Unsatisfactory attempts at prevention have been made, such as a sponge held in the mouth. This absorbs the fumes of hydrochloric acid, but becomes a source of irritation to the lips. Mechanical defects in the teeth are common whenever the latter are used for tightly holding hard substances, such as nails, or for biting threads. The incisors naturally suffer, and it should be readily possible to state whether a tailor is right- or lefthanded. The so-called lines above the roots of the teeth, believed formerly to have great significance, can be prevented by proper mouth hygiene, so that, if all workers in copper, brass, lead, etc., were cleanly in this respect, no stigmata would be in evidence.—Kraus, *Berliner Klin. Wochenschrift*, per *Universal Med. Record.*

Noise vs. Silence in the Dentist's Operating Room.—Efficiency engineers recommend that noise be eliminated from workshop and factory. Experiments prove beyond question that men working in a quiet, dignified atmosphere can do more and better work than when their attention is distracted by noise. Violent atmospheric vibrations unquestionably destroy nerve energy; we all know how difficult it is to concentrate our minds amid distracting noise.

Dentists should bear this in mind. The operating room should be in the quietest nook that can be selected. Assistants should be trained to handle instruments in such a manner as to render these manipulations noiseless. Equipments should be used that work without friction. Not long ago the writer sat in the waiting-room of a prominent dentist. The electric engine in use at the chair made such violent vibrations as to be easily audible in the adjoining room. Imagine the effect it must have on the operator to listen to this harsh, grating noise several hours each day. No wonder he leaves the chair utterly exhausted at three or four o'clock in the afternoon, and who will doubt that his nerve force is wasted and his efficiency lowered by this useless noise.

Every operator should make his operating room a zone of quietude, and strive to eliminate the nerve exhaustion that follows constant and irritating noise.—M. Dewey, *Internat. Journ. of Orthodontia.*

Apicoectomy.—Root amputation, in the treatment of dento-alveolar abscesses, is an operation of necessity and not of choice. Although when properly carried out it almost invariably gives good results, it should be resorted to only when other less radical methods have failed.

The conditions where this operation is indicated are the following: Where the area of necrosis is so large, and the infiltration of pus into the surrounding tissues is so extensive that thorough asepsis cannot be established, and all of the infected and broken-down tissues cannot be eliminated by the medicaments conveyed through the root-canal or canals of the offending tooth. When a broach is broken in let us say the apical third of the root, which precludes the possibility of properly cleansing and filling the root, it is good practice to fill the latter to the broach and amputate the part containing the foreign body. Multi-rooted teeth in which one root has been devitalized by extensive pyorrhea or by atrophy of the gums and the alveolus, are also good subjects for this procedure. The pulp chamber and the canals of the retained roots should be filled, and the one bereft of its bony support should be amputated.

Before undertaking this operation it is advisable to have the root-canal rendered aseptic and filled, and to secure a good radiograph to show the condition of the root and its surrounding tissues and its position.

A semilunar incision is produced with a sharp lancet, cutting through the tissues to the bone, about one-half of an inch from the gingival margin, with its crescent toward the crowns of the teeth. With a periosteum elevator this flap of tissue is raised, and the bone exposed. A small ridge produced by the root of the tooth will usually indicate about the position of the apex. With a surgical bur, a trephine, or else with a chisel, the bone overlying the apex is removed and the apex exposed. By doing this we have a clear field of operation, and will avoid such undesirable mistakes as injuring or amputating the adjacent teeth. We can now with a fissure or round bur cut away the portion of the root penetrating the abscess cavity and devoid of its bony support. The stump end should be rounded off and smoothed next with a curet or finishing bur, and the entire abscess tract curetted out, removing all the débris and infected tissues. The cavity is flushed out with an antiseptic solution, and dressed so that the edges of the wound can be approximated.

Where the area of infection is not very extensive after a few dressings, the wound can be left unpacked, and the patient instructed to use an antiseptic mouth-wash.—A. Berger, *Items of Interest.*

Hints, Queries, and Comments.

A METHOD OF PREPARING THE GINGIVAL BASE FOR A GOLD INLAY.

We all recognize that the gingival margin of a cavity is the danger-point in our fillings and inlays, especially the latter. We also know that non-cohesive foil can be adapted to cavity walls and margins more closely than any other form of gold. The line of cement at the gingival margin of a gold inlay, no matter how closely we have burnished our inlay margin to the cavo-surface angle, should be a source of anxiety to every dentist. The following plan may be new, or it may not be; it is certainly efficacious: Apply the rubber dam and prepare the gingival base as for a cohesive gold filling, with convenience points at the axio-gingival point angles. Start the filling in these points with cohesive foil and build across the axio-gingival angle; then place three cylinders of non-cohesive gold at the gingival base with their ends extending beyond the gingival margin. Press these cylinders into place, using a foot plugger—*but do not mallet.* The middle cylinder acts as a wedge. Hold this non-cohesive layer in position while you extend the cohesive foil from the axio-gingival angle toward the margin to cover it. When you have a layer of cohesive foil completely over the floor, mallet the mass into position. This drives the non-cohesive foil into place. In finishing the floor or base of gold, use a broad foot plugger with fine serrations; also mallet and finish the margin of gold to perfect adaptation. The thickness of this base need not be more than one millimeter; the finely serrated floor makes an ideal base for the inlay, and you have no contact of cement with gingival margin. When the base is completed, remove the dam and proceed as usual. I find that the added time for this method of inlay work is not more than thirty minutes, and I am a slow operator.

Albert J. Butler, D.D.S.

Pasadena, Cal.

Obituary.

DR. H. B. McFADDEN.

[See Frontispiece.]

Died, from pneumonia, February 14, 1915, at his home, 3505 Hamilton st., Philadelphia, Henry Birkinbine McFadden, D.D.S.

Dr. McFadden was the son of Dr. Wm. Henry McFadden, a graduate of the University of Pennsylvania, class of 1849, and Sarah Evans (Yocum) McFadden. He was born in Germantown, Philadelphia, October 30, 1861, and received his early education in the public and private schools of Philadelphia.

He was graduated in dentistry with the class of 1882 of the dental school of the University of Pennsylvania, and later continued his studies under Prof. Charles J. Essig. He began the practice of his profession at his residence, 3505 Hamilton st., Philadelphia, May 1, 1883. For ten years Dr. McFadden was demonstrator of mechanical dentistry in the dental school of the University of Pennsylvania, where he was an earnest and efficient teacher. He always maintained an active and earnest interest in dental society affairs. He held membership in the National Dental Association, of which he was treasurer from 1911 until the time of his death; he was also a member of the Pennsylvania State Dental Society and its second vice-president, a member of the Academy of Stomatology of Philadelphia, the Odontographic Society of West Philadelphia, the First District Dental Society of the State of New York, and the Dental Alumni Society of the University of Pennsylvania. He was a member of the University of Pennsylvania Club of New York City, of the Union League of Philadelphia, of the National Dental Protective Association,

the National Mouth Hygiene Association, of the University Lodge No. 610, Philadelphia, the Corinthian Chasseur Commandery Knights Templar, the Crescent Boat Club, and various other social, Masonic, and professional organizations. He was unmarried.

Dr. McFadden's remains were interred at Laurel Hill Cemetery, Philadelphia, February 17, 1915.

Dr. McFadden was a striking and interesting personality. Warm-hearted and affectionate in disposition, kindly and generous in his relations with humanity, sympathetic and responsive, his was a nature which drew about him hosts of friends and gave him a popularity of the kind which "doth honor a man," but the outstanding attributes of his character which more than all else won for him the confidence and esteem of his colleagues, and which more than all else contributed to his popularity and success in the activities of his profession, were his sterling integrity and his high sense of personal honor. His loyalty as an attribute of character was perhaps equally pronounced. To him a friendship was sacred, and his loyalty to his friends was unshakable. Nevertheless, his loyalty to truth and righteousness, as he saw the truth and as he understood righteousness, dominated all other considerations, and it is this combination of attributes in a man which in their totality are sufficiently remarkable to place them almost in the category of peculiarities. All who knew him trusted him, for he never broke faith. These qualities combined with his intense interest in all that had to do with the advancement of his chosen profession made him a tower of strength in the counsels of those who were immediately concerned with dental professional activities. He was a wise counselor and an earnest and indefatigable worker in any cause that concerned the welfare of his profession.

His death came almost without warning in its suddenness. He was chairman of the committee having in general charge the social entertainments related to the dedication of the Evans Institute, and in the midst of his activities he was stricken, his death resulting from acute pneumonia in about three days. His decease cast a gloom over all of the exercises, and a burden of sorrow upon the hearts of all of his friends who were associated with him or who participated in the activities of that occasion. The announcement of his death will bring sorrow to a very wide circle of friends and acquaintances, and all will concur in the belief that by his death the profession of dentistry has sustained an irreparable loss.

DR. J. CARROLL WHINNERY.

DIED. December 25, 1914, at Los Angeles, Cal., J. CARROLL WHINNERY, D.D.S.

J. Carroll Whinnery was born in Salem, Ohio. His early education was obtained in the public and high schools of that city; later he attended Union College at Mount Vernon, Ohio.

He was graduated from the Boston Dental College on March 1, 1876. For five years he practiced in San Francisco, and in 1882 located in Omaha, at which place he continued practice until he retired, a few years before his death.

Dr. Whinnery had returned to California in the hope of regaining health, but had been there only one week when the end came.

The deceased was the first dean of the old Omaha Dental College, in later years consolidated with the dental department of Creighton University.

DR. RALPH E. LUTHER.

DIED. February 12, 1915, at St. Luke's Hospital, Chicago, Ill., from pneumonia, in his thirty-ninth year, RALPH E. LUTHER, D.D.S., of Batavia, N. Y.

Ralph E. Luther was born in Warsaw, N. Y., October 26, 1876. He was a graduate of the Warsaw high school, and the dental department of the University of Buffalo, class of 1900, and in September of the same year commenced the practice of dentistry in Batavia.

He married Miss Marion Duncan in 1901, and is survived by his wife, two sons, Duncan and John, his mother, Mrs. Mary E. Luther, two brothers, Kendrick of Syracuse, and Guy S. of Schenectady, and a sister, Mrs. Roy McGregory of Batavia.

He was a charter member of Mu Chapter Xi Psi Phi Fraternity, and had served as deputy supreme president. He was a member and past president of the Eighth District and of the Batavia Dental Societies, member of the Dental Society of the State of New York and chairman of the committee on Oral Hygiene, member of the National Dental Association, and of the Rochester City Dental Society. He was also a member of the

Masonic fraternity, and various other local organizations, but was particularly active in affairs of the Young Men's Christian Association and the Boy Scouts, where he rendered much valuable service by his untiring energy and enthusiasm.

Dr. Luther took a prominent part in matters connected with Oral Hygiene, and was one of the pioneers in the work in this state. He had made a specialty of pyorrhea work, and just prior to his death had completed a course in Chicago. He was a man of fine ability as an operator, and gave much promise of a brilliant future. He was an upright, conscientious, high-class professional man, one who observed all the finer rules of conduct toward his patients and the profession. He was a splendid type of a high-toned professional gentleman. In his death the profession loses an intelligent, able, and indefatigable worker, and his family and friends a kind, generous and lovable companion and friend. His loss will be mourned by a large circle of friends and acquaintances, who honored him for his many attractive qualities of heart and mind.

H. J. B.

DR. WILLIAM ERNEST WALKER.

Died, November 21, 1914, in New Orleans, La., of uremia, in his forty-seventh year, William Ernest Walker, D.D.S., M.D.

William Ernest Walker was born in New Orleans, La., on March 3, 1868, as the son of Dr. J. R. Walker, who practiced dentistry in New Orleans up to the time of his death in 1887, and Jeanie Mort, who was known to the dental profession as a contributor of many articles and practical hints to various dental journals under the *nom de plume* of "Mrs. M. W. J."

The deceased attended the public schools of New Orleans, and served his dental apprenticeship in his father's office, later being graduated with high honors from the Baltimore College of Dental Surgery in 1889. He first engaged in dental practice in Bay St. Louis, Miss., and then moved to Pass Christian, Miss., where he enjoyed a large *clientèle*. While practicing in the latter city, he occupied the chair of clinical dentistry in the Dental Department of the Southern Medical College in Atlanta, Ga., at the same time taking a medical course.

After two years' sojourn in Atlanta, he became connected with the Baltimore College of Physicians and Surgeons, occupying the chair of operative dentistry while completing his medical studies. After obtaining the degree of M.D., he resigned his professorship in order to devote all his time to dental practice.

The deceased became more and more interested in orthodontia, and, after moving to New Orleans about twelve years ago, gave up the general practice of dentistry, and limited his practice to orthodontia and facial orthopedia, in which specialty he was remarkably successful. During his first few years of practice in New Orleans, the deceased was dean of the New Orleans College of Dentistry, where he taught orthodontia.

At the time of his sudden and untimely demise, Dr. Walker was secretary and treasurer of the American Society of Orthodontists, member of Delta Sigma Delta Fraternity and of numerous local, state, and national dental and medical associations.

As a fruit of his painstaking studies, the deceased first pointed out the anatomical fact of the downward and forward movement of the condyles, and invented the well-known anatomic articulator, the predecessor of many similar devices. He also designed a number of appliances of special interest and value for the orthodontist.

"IN MEMORIAM" RESOLUTIONS.

Dr. James Truman and Dr. Louis Jack.

The Academy of Stomatology of Philadelphia, on January 26, 1915, passed the following resolutions upon the death of Dr. James Truman and Dr. Louis Jack, as prepared by the committee to whom the matter was referred:

Whereas, Death, which cometh unto all, having removed from among us James Truman, D.D.S., LL.D., and Louis Jack, D.D.S., it becomes our mournful pleasure to record a few of their many and brilliant virtues. It is not often that the dental profession is called upon to lament within so brief a period the death of two such exalted characters. Their lives had run parallel for sixty years. Graduated, as they were, as classmates in 1854 from the Philadelphia College of Dental Surgery, which afterward changed its name to the Pennsylvania College of Dental Surgery, they had lived and labored for nearly sixty years in the same community,

with the same aims and aspirations, and for the uplift of dentistry as a profession. There were certain characteristics which they shared in common. They were dignified in manner, urbane in disposition, strictly honest and moral in character, noble and ethical in their dealings with their fellow men. Exalted in their chosen profession, they were comrades whom we honored as dentists and loved as men; therefore be it

RESOLVED, That it is the sense of the Academy of Stomatology of Philadelphia that in the death of these fathers in dentistry the profession at large, and this society in particular, have lost two of their most honored and distinguished members.

RESOLVED, That these resolutions be engrossed upon the records of the Academy, and that a copy be sent to the family of one, and the surviving relative of the other.

EDWIN T. DARBY,
DANIEL NEALL MCQUILLEN,
EDWARD C. KIRK,
Committee.

SOCIETY NOTES AND ANNOUNCEMENTS.

DENTAL SOCIETY MEETINGS:

April, May, and June.

APRIL.

CONNECTICUT STATE DENTAL ASSOCIATION. Hartford. Three days: April 20th to 22d.

MICHIGAN STATE DENTAL SOCIETY. Grand Rapids. Three days: April 15th to 17th.

MISSISSIPPI DENTAL ASSOCIATION. Jackson. Three days: April 20th to 22d.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA. Pittsburgh. Two days: April 13th and 14th.

SOUTH CAROLINA STATE DENTAL ASSOCIATION. Columbia. Four days: April 27th to 30th.

SOUTHERN MINNESOTA DISTRICT DENTAL SOCIETY. Mankato. Three days: April 12th to 14th.

MAY.

DENTAL SOCIETY OF THE STATE OF NEW YORK. Albany. Three days: May 13th to 15th.

ILLINOIS STATE DENTAL SOCIETY. Peoria. Four days: May 11th to 14th.

INDIANA STATE DENTAL ASSOCIATION. Indianapolis. Three days: May 18th to 20th.

INTERSTATE ASSOCIATION OF ANESTHETISTS. Cincinnati, Ohio. Two days: May 4th and 5th.

KANSAS STATE DENTAL ASSOCIATION. Topeka. Three days: May 25th to 27th.

LAKE ERIE DENTAL ASSOCIATION. Cambridge Springs, Pa. Three days: May 20th to 22d.

MASSACHUSETTS DENTAL SOCIETY. Boston. Three days: May 5th to 7th.

NEBRASKA STATE DENTAL SOCIETY. Omaha. Three days: May 18th to 20th.

SUSQUEHANNA DENTAL ASSOCIATION OF PA. Wilkes-Barre. Three days: May 18th to 20th.

TEXAS STATE DENTAL ASSOCIATION. Galveston. Four days: May 19th to 22d.

JUNE.

KENTUCKY STATE DENTAL ASSOCIATION. Ashland. Three days: June 8th to 10th.

LOUISIANA STATE DENTAL SOCIETY. New Orleans. Three days: June 3d to 5th.

MAINE DENTAL SOCIETY. Portland. Three days: June 28th to 30th.

MINNESOTA STATE DENTAL ASSOCIATION. Minneapolis. Two days: June 11th and 12th.

MISSOURI STATE DENTAL ASSOCIATION. Jefferson City. Three days: June 10th to 12th.

NEW HAMPSHIRE DENTAL SOCIETY. Weirs. Three days: June 22d to 24th.

NORTH CAROLINA DENTAL SOCIETY. Wrightsville Beach. Three days: June 23d to 25th.

TENNESSEE STATE DENTAL ASSOCIATION. Sewanee. Three days: June 24th to 26th.

Examiners' Meetings.

CALIFORNIA BOARD OF EXAMINERS. San Francisco, June 4th; Los Angeles, June 18th.

MARYLAND BOARD OF EXAMINERS. Baltimore. May 27th and 28th.

MICHIGAN BOARD OF EXAMINERS. Ann Arbor. June 14th to 19th.

NEBRASKA BOARD OF EXAMINERS. Lincoln. June 9th.

NEW HAMPSHIRE BOARD OF REGISTRATION. Manchester. June 14th to 16th.

NORTH CAROLINA BOARD OF EXAMINERS. Wrightsville Beach. June 21st.

SOUTH CAROLINA BOARD OF EXAMINERS. Columbia. June 15th.

TEXAS BOARD OF EXAMINERS. Dallas. June 21st.

VIRGINIA BOARD OF EXAMINERS. Richmond. June 8th.

WISCONSIN BOARD OF EXAMINERS. Milwaukee. June 21st.

DENTAL RED CROSS FUND.

At the meeting of the American Institute of Dental Teachers held at Ann Arbor, Michigan, on January 26th, it was decided to take steps that should result in the raising of a fund to be used through the Red Cross Society in giving relief and aid to the soldiers in Europe who are suffering from oral and dental injuries. The president was instructed to appoint a committee to take charge of this matter. President F. W. Gethro, under this instruction, appointed the following Executive and General committees:

Executive Committee.

C. R. E. Koch, *Chairman;* John F. Biddle, *Sec'y;* Henry W. Morgan, E. A. Johnson. Ellison Hillyer.

General Committee.

E. C. Kirk, Philadelphia.
J. H. Kennerly, St. Louis.
H. C. Miller, Portland, Ore.
D. M. Gallie, Chicago.
John F. Biddle, Pittsburgh.
E. T. Darby, Philadelphia.
Alfred Owre, Minneapolis.
B. Holly Smith, Baltimore.
E. A. Johnson, Boston.
Frank Holland, Atlanta.
D. M. Cattell, Memphis.
Frederick R. Henshaw, Indianapolis.
S. W. Bowles, Washington.
E. H. Smith, Boston.
A. H. Hipple, Omaha.
Ellison Hillyer, New York.
Truman W. Brophy, Chicago.
D. H. Squire, Buffalo.
H. E. Friesell, Pittsburgh.
Henry W. Morgan, Nashville.
I. N. Broomell, Philadelphia.
Wallace Wood, New Orleans.
Frank T. Breene, Iowa City.
H. L. Banzhaf, Milwaukee.
J. G. Sharp, San Francisco.
G. V. Black, Chicago.
W. T. Chambers, Denver.
H. M. Semans, Columbus.
J. D. Patterson, Kansas City.
N. S. Hoff, Ann Arbor.
C. N. Johnson, Chicago.
H. L. Wheeler, New York.
L. E. Ford, Los Angeles.
C. R. E. Koch, Chicago.
H. B. Tileston, Louisville.

The Executive Committee is preparing contribution certificate booklets, each containing twenty certificates or coupons certifying that the holder thereof has contributed twenty-five cents to this fund. This certificate will be neatly lithographed, something like national currency. It will be printed in lilac ink—the color of the dental profession—and bear upon its face the red Geneva cross.

It is hoped that the dental schools, dental students, and dental societies, as well as the profession at large, will become sufficiently interested in this propaganda to secure a large enough fund through these small contributions to secure real relief for the class of war sufferers for which it is designed. That it may aid in the establishment of several special hospitals or wards devoted to dental and oral surgical injuries, within the belligerent zone of Europe, is the ultimate purpose of this movement.

Make applications for booklets to any member of Executive or General Committees.

INTERSTATE ASSOCIATION OF ANESTHETISTS.

The Interstate Association of Anesthetists will hold its organization meeting in conjunction with the Ohio State Medical Association in Cincinnati, Ohio, May 4 and 5, 1915, at which time an elaborate scientific program devoted exclusively to recent advances in anesthesia and analgesia will be presented, as follows:

"Foreword," Robert Carothers, Councilor First District O. S. M. A. "Selection of the Anesthetic," Emmett F. Horine, Louisville, Ky. "Nitrous Oxid Anesthesia in Obstetrics," Arthur E. Guedel, Indianapolis, Ind. "Blood-pressure under General Anesthesia," E. I. McKesson, Toledo, O. "Conductive Analgesia for Intra-oral Operations," Hugh MacMillan, Cincinnati, O. "Alkaloidal Medication in Relation to Anesthesia and Analgesia," Isabella C. Herb, Chicago, Ill. "Anesthesia for Brain Surgery," Charles K. Teter, Cleveland, O. "Use of Music during Analgesia," W. P. Burdick, Kane, Pa. "Magnesium Sulfate Narcosis," D. D. DeNeen, Cincinnati, O. "Ethyl Chlorid Anesthesia," R. A. Rice, Columbus, O. "Intravenous Anesthesia," C. L. Candler, Detroit, Mich. "Preparatory, Operative, and Postoperative Precautions for Hazardous Anesthetic Risks," Moses Salzer, Cincinnati, O. "Vapor Anesthesia for Intra-oral Operations," Paul R. Coble, Indianapolis,

Ind. "Local Anesthesia for Hernia Operations," Chas. T. Souther, Cincinnati, O. "Surgical Mortality from the Standpoint of the Anesthetist." H. W. Kearney, Washington, D. C. "Nitrous Oxid-Oxygen Analgesia in Dentistry," Edward S. Barber, Chicago, Ill. "Posture and Muscular Relaxation as Factors in the Newer Conception of Shock," Willis D. Gatch, Indianapolis, Ind. "Spinal Anesthesia," John Overton, Tulsa, Okla. "Acapnia." E. M. Sanders, Nashville, Tenn. "Local Analgesia for Nose, Throat, and Larynx Operations," Myron T. Metzenbaum, Cleveland, O. "Anesthesia a Full-fledged Specialty," W. Hamilton Long, Louisville, Ky. "Anesthesia, Anesthetists, and Workmen's Compensation Laws," F. H. McMechan, Cincinnati, O. "Intratracheal Anesthesia," B. Merrill Ricketts, Cincinnati, O. With Demonstration of a Portable Field Apparatus by Major Allie Williams, U. S. A., Washington, D. C.

Headquarters, assembly-room, and exhibits will be in the new Hotel Gibson, in which all the sections of the Ohio State Medical Association will also meet. An informal organization dinner will be served on the evening of May 4th, after which the visiting anesthetists will be the guests, at a "smoker," of the Local Entertainment Committee, headed by Dr. E. O. Smith. Visiting ladies will be entertained by Dr. Nora Crotty and her committee at a reception and theater party.

Anesthetists, surgical and dental, as well as interested surgeons and general practitioners who wish to participate in the proceedings are cordially invited to attend. For further information and dinner reservations address

F. H. McMechan, M.D., *Sec'y*,
1044 Wesley ave., Cincinnati, Ohio.

AMERICAN INSTITUTE OF DENTAL TEACHERS.

At the last annual meeting of the American Institute of Dental Teachers, held at Ann Arbor, Mich., the following officers were elected for the ensuing year: H. M. Semans, Columbus, Ohio, president; S. W. Bowles, Washington, D. C., vice-president; J. F. Biddle, 517 Arch st., N. S., Pittsburgh, Pa., secretary-treasurer. Executive Board—A. W. Thornton, Montreal, Canada; R. W. Bunting, Ann Arbor, Mich., A. D. Black, Chicago, Ill.

The next annual meeting will be held at Minneapolis, Minn., January 25, 26, and 27, 1916.

MICHIGAN STATE DENTAL SOCIETY.

The next meeting of the Michigan State Dental Society will be held at Grand Rapids, April 15, 16, and 17, 1915.

F. Ward Howlett, *Sec'y*, Jackson, Mich.

SOUTHERN MINNESOTA DISTRICT DENTAL SOCIETY.

The Southern Minnesota District Dental Society will hold its annual meeting April 12, 13, and 14, 1915, at Mankato. A literary and clinical program will be carried out.

G. W. Norris, *Sec'y*,
Tracy, Minn.

CONNECTICUT STATE DENTAL ASSOCIATION.

The fifty-first annual meeting of the Connecticut State Dental Association will be held at Hartford, Conn., April 20, 21, and 22, 1915.

Charles H. Riggs, *President*.
Hartford, Conn.
Elwyn R. Bryant, *Sec'y*,
New Haven, Conn.

PHILADELPHIA DENTAL COLLEGE.

Alumni Society.

The annual meeting of the Alumni Society of the Philadelphia Dental College will be held in the College building, Eighteenth and Buttonwood sts., Philadelphia, Wednesday, April 14, 1915.

Dr. Wm. A. Spring, president of the American Dental Society of Europe, will read a paper, entitled "The Career of the American Dentist Abroad," at 10 o'clock on Wednesday morning, after which a luncheon will be served in the College building. The clinics will be held in the afternoon at 2 o'clock, and the annual banquet at 6.30 P.M.

S. I. Williams, *Sec'y*.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA.

The thirty-fourth annual meeting of the Odontological Society of Western Pennsylvania will be held at the Monongahela House, Pittsburgh, Pa., Tuesday and Wednesday, April 13 and 14, 1915.

The first regular session of the society will open on Tuesday at 10.30 A.M. The Executive Council will meet at the hotel at 10 A.M. for

the transaction of business in the interest of the society.

The clinics and exhibits will be at the Monongahela House. Exhibitors are cordially invited to visit this meeting, and requested to make early reservation for space. Address Dr. Leslie Waddill, Jenkins Arcade, Pittsburgh, Pa.

A cordial invitation is extended to all ethical dentists in Pennsylvania and adjoining states.

KING S. PERRY, *Sec'y*,
719 Jenkins Bldg., Pittsburgh, Pa.

SOUTH CAROLINA STATE DENTAL ASSOCIATION.

NOTE CHANGE OF DATE.

THE annual meeting of the South Carolina State Dental Association will be held at the Jefferson Hotel, Columbia, S. C., April 27 to 30, 1915.

Special public session, devoted to the relationship of defective teeth to the public health, will be held in the afternoon and evening of April 29th.

P. D. BROOKER, *President*,
Columbia, S. C.
E. C. DYE, *Sec'y*,
Greenville, S. C.

SECOND DISTRICT (N. Y.) DENTAL SOCIETY.

YOU are invited by the Second District (N. Y.) Dental Society to attend a dinner and meeting on Monday evening, April 12, 1915, in the new Hotel Bossert, Brooklyn, N. Y.

Reserve this evening for a meeting that will signalize a marked advance in scientific dentistry. Dr. Elmer S. Best of Minneapolis, Minn., will read his paper on "The Responsibility of the Dentist in Pulpless Teeth." This is the result of over two years' experiment, study, and trial. Some of the ablest men in the medical and dental professions will discuss this problem.

The dinner, an informal one, will be $ per person. Tables for six and eight will be reserved upon receipt of check made payable to Arthur M. Hunter, treasurer of the dinner committee, 67 Hanson Place, Brooklyn.

A. M. NODINE, *Chairman*,
F. C. WALKER,
A. H. HUNTER, *Committee*.

MISSISSIPPI DENTAL ASSOCIATION.

THE fortieth annual meeting of the Mississippi Dental Association will be held in Jackson, April 20, 21, and 22, 1915.

M. B. VARNADO, *Sec'y*, Osyka, Miss.

MASSACHUSETTS DENTAL SOCIETY.

THE fifty-first annual meeting of the Massachusetts Dental Society will be held May 5, 6, and 7, 1915, in the Hotel Somerset, Boston, Mass.

A. H. ST.C. CHASE, *Sec'y*.

ILLINOIS STATE DENTAL SOCIETY.

THE fifty-first annual meeting of the Illinois State Dental Society will be held at Peoria, May 11, 12, 13, and 14, 1915.

J. N. BARCUS, *President*,
HENRY L. WHIPPLE, *Sec'y*.

LAKE ERIE DENTAL ASSOCIATION.

THE fifty-second annual meeting of the Lake Erie Dental Association will be held at Hotel Bartlett, Cambridge Springs, Pa., May 20, 21, and 22, 1915.

J. F. SMITH, *Sec'y*,
Erie, Pa.

NEBRASKA STATE DENTAL SOCIETY.

THE forty-eighth annual meeting of the Nebraska State Dental Society will be held in Omaha, Nebr., May 18, 19, and 20, 1915.

WM. A. MCHENRY, *President*,
H. J. PORTER, *Sec'y*,
Cambridge, Nebr.

KANSAS STATE DENTAL ASSOCIATION.

NOTE CHANGE OF DATE.

THE Kansas State Dental Association will hold its next annual meeting at Topeka, Kans., May 25, 26, and 27, 1915.

A most unique program will be presented. Dr. Thos. P. Hinman of Atlanta, Ga., will be the guest of honor.

A. L. BENTON, *Sec'y*,
Garnett, Kans.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE forty-seventh annual meeting of the Dental Society of the State of New York will be held at Albany, N. Y., Thursday, Friday, and Saturday, May 13, 14, and 15, 1915.

The Executive Council will meet at the Hotel Ten Eyck, Wednesday afternoon, May 12th, at 3 P.M., for the transaction of business.

The first regular session of the society will open on Thursday at 10.30 A.M. The literary program will be rendered in the auditorium of the Educational Building. Headquarters for Officers and Executive Council will be at the Hotel Ten Eyck.

The clinics and exhibits will be at the Hotel Ten Eyck. Exhibitors are cordially invited to visit this meeting, and requested to make early reservations for space. Address Dr. O. J. Gross, Schenectady, N. Y., for space.

A cordial invitation is extended to all ethical dentists in New York and sister states.

A. P. BURKHART, *Sec'y*,
52 Genesee st., Auburn, N. Y.

INDIANA STATE DENTAL ASSOCIATION.

THE next annual meeting of the Indiana State Dental Association will be held in Indianapolis, on May 18, 19, and 20, 1915. A distinctive feature of this meeting will be that the program will be made up exclusively of Indiana dentists. A cordial invitation is extended to members of other dental societies to attend the meeting.

A. R. ROSS, *Sec'y*,
Lafayette, Ind.

TEXAS STATE DENTAL ASSOCIATION.

THE thirty-fifth annual meeting of the Texas State Dental Association will be held in Galveston, Texas, May 19, 20, 21, and 22, 1915. The special feature of this meeting will be postgraduate lectures and clinic work.

Dr. G. Walter Ditmar of Chicago will present modern scientific bridge work and removable partial dentures, with preparations, technique, and principles involved. Dr. B. F. Thielen will present "Plate Work." Dr. T. G. Duckworth, "Orthodontia." Dr. R. D. Griffis, "Nitrous Oxid Analgesia and Anesthesia." Dr. Julian Smith, "Pyorrhea." Dr. J. M. Murphy, "Local Anesthesia."

Exhibitors are requested to attend, and to write to Dr. A. L. Frew, Dallas, for space. General clinics, on last day. Clinicians will write Dr. W. H. Nugent, Fort Worth. For any other information write the secretary.

C. M. MCCAULEY, *Pres.*, Dallas.
W. O. TALBOT, *Sec'y-Treas.*, Fort Worth.

LOUISIANA STATE DENTAL SOCIETY.

THE next Louisiana State Dental Society meeting will be held in New Orleans, La., June 3, 4, and 5, 1915, at the Grunewald Hotel.

P. W. TROWBRIDGE, *Sec'y*.

TENNESSEE STATE DENTAL ASSOCIATION.

THE forty-eighth annual meeting of the Tennessee State Dental Association will be held in Sewanee, Tenn., June 24, 25, and 26, 1915.

C. O. RHEA, *Sec'y*,
Nashville, Tenn.

NORTH CAROLINA DENTAL SOCIETY.

THE next annual meeting of the North Carolina Dental Society will be held at Wrightsville Beach, June 23, 24, and 25, 1915.

R. M. SQUIRES, *Sec'y*,
Wake Forest, N. C.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA.

THE fifty-second annual meeting of the Susquehanna Dental Association will be held at Irem Temple, Wilkes-Barre, Pa., May 18, 19, and 20, 1915.

GEO. C. KNOX, *Recording Sec'y*.

NEW HAMPSHIRE DENTAL SOCIETY.

THE next meeting of the New Hampshire Dental Society will be held at the New Hotel Weirs, Weirs, N. H., June 22, 23, and 24, 1915.

C. S. COPELAND, *President*,
L. I. MOULTON, *Sec'y*.

MINNESOTA STATE DENTAL ASSOCIATION.

The thirty-second annual convention of the Minnesota State Dental Association will be held in Minneapolis, Minn., June 11 and 12, 1915.

Max E. Ernst, *Sec'y*,
St. Paul, Minn.

MAINE DENTAL SOCIETY.

The fiftieth anniversary meeting of the Maine Dental Society will be held in the Lafayette Hotel, Portland, Me., on June 28, 29, and 30, 1915.

I. E. Pendleton, *Sec'y*,
Lewiston, Me.

KENTUCKY STATE DENTAL ASSOCIATION.

The Kentucky State Dental Association will hold its forty-sixth annual meeting at Ashland, June 8, 9, and 10, 1915. The program will be carried out on the progressive clinic order. All reputable dentists are invited to attend.

Chas. R. Shacklette, *Sec'y*,
Louisville, Ky.

MISSOURI STATE DENTAL ASSOCIATION.

Change of Date of Meeting.

The Golden Jubilee meeting of the Missouri State Dental Association to be held at Jefferson City, Mo., has been postponed until June 10, 11, and 12, 1915. Elaborate preparations are being made to celebrate the semi-centennial meeting of this association on an elaborate scale. Special announcement later. For information address

S. C. A. Rubey, *Sec'y*,
1017 New York Life Bldg., Kansas City, Mo.

RICHMOND COUNTY (N. Y.) DENTAL SOCIETY.

On February 10, 1915, at the Hotel St. George, the Richmond County Dental Society of the dentists practicing on Staten Island was organized for the mutual benefit of all practicing dentists of the island, and for the promotion of friendly relationship between the members of the profession, the following officers being elected: C. G. Stiles, president; J. A. Smith, vice-president; D. J. Machol, secretary; L. A. Lamonte, treasurer.

The regular monthly meetings of the newly organized society will be held on every second Monday of the month. The first regular meeting was held on March 8th, every practicing dentist of Staten Island, but one, attending.

NEW JERSEY STATE DENTAL SOCIETY.

The forty-fifth annual convention of the New Jersey State Dental Society will be held at Asbury Park on July 21, 22, 23, and 24, 1915.

The headquarters will be located at the Coleman House. The ballroom will be used for all meetings of the society. The glass-inclosed Casino over the ocean, just across the ocean drive from the Coleman House, has been secured for the exhibits and clinics. With over 2000 more square feet of floor-space than the pavilion used last year there should be adequate room.

Dr. Chauncey F. Egel of Westfield, N. J., is chairman of the Exhibit Committee, and reports that applications are already being made for space. Dr. W. W. Hodges of Perth Amboy is arranging for an attractive list of clinics. The Essay Committee, under the chairmanship of Dr. James I. Woolverton of Trenton, will have three essayists of prominence to present.

A cordial invitation to attend is extended to all ethical practitioners.

John C. Forsyth, *Sec'y*,
430 E. State st., Trenton, N. J.

MARYLAND BOARD OF EXAMINERS.

The Maryland Board of Dental Examiners will meet for examination of candidates for certificates May 27 and 28, 1915, at the Dental Department of the University of Maryland, Baltimore, at 9 A.M.

For application blanks and further information, apply to

F. F. Drew, *Sec'y*,
701 N. Howard st., Baltimore, Md.

VIRGINIA BOARD OF EXAMINERS.

THE regular annual meeting of the Virginia State Board of Dental Examiners, for the examination of applicants to practice dentistry in the State of Virginia, will be held in the city of Richmond, Va., June 8, 1915, commencing at 9 A.M.

For further particulars apply to

J. P. STIFF, *Sec'y*, Fredericksburg, Va.

NEBRASKA BOARD OF EXAMINERS.

THE next meeting of the Nebraska Board of Dental Examiners will be held at Lincoln, Nebr., beginning at 9 A.M., Wednesday June 9, 1915.

All applications must be in the hands of the secretary not later than June 1, 1915. Application blanks may be obtained by addressing

J. H. WALLACE, *Sec'y*,
212 Brown Block, Omaha.

NEW HAMPSHIRE BOARD OF REGISTRATION.

THE annual meeting of the New Hampshire Board of Registration in Dentistry, for examinations, will be held June 14, 15, and 16, 1915, at Masonic Banquet Hall, Manchester, N. H.

For application blanks or further information address

HARRY L. WATSON, *Sec'y*,
913 Elm st., Manchester, N. H.

WISCONSIN BOARD OF EXAMINERS.

THE Wisconsin State Board of Dental Examiners will convene in Milwaukee, at Marquette University, on June 21, 1915, at 2 P.M., for examination of applicants.

High-school diploma, application, and $25 fee to be filed with the secretary ten days prior to above date. Dental diploma to be presented in advance of the examination.

Junior dental students presenting a clear card for two years' unconditional work from a reputable dental college and filing a high-school diploma, or its full equivalent, will be permitted to participate in the theory examination in the following six major subjects: Anatomy, physiology, histology, chemistry, bacteriology, materia medica. Satisfactory grades made in these subjects will be credited at subsequent examinations.

Special application blanks for this examination and $10 fee, together with high-school credits, to be filed ten days in advance.

S. H. CHASE, *President*,
W. T. HARDY, *Sec'y*,
1404 Majestic Bldg., Milwaukee, Wis.

CALIFORNIA BOARD OF EXAMINERS.

THE next meeting of the Board of Dental Examiners of California for the purpose of examining applicants for a license to practice dentistry will be held in the city of San Francisco, beginning on June 4, 1915. This examination will be followed by one to be held in the city of Los Angeles, beginning on June 18, 1915. For further particulars, address

C. A. HERRICK, *Sec'y*,
133 Geary st., San Francisco, Cal.

MICHIGAN BOARD OF EXAMINERS.

THE next regular meeting of the Michigan State Board of Dental Examiners, for the examination of applicants who wish to practice dentistry in Michigan, will be held in the dental college at Ann Arbor, beginning Monday, June 14, 1915, at 8 A.M., and continuing through Saturday, June 19th.

For application blanks and full information apply to

A. W. HAIDLE, *Sec'y*, Negaunee, Mich.

NORTH CAROLINA BOARD OF EXAMINERS.

THE next regular meeting of the North Carolina State Board of Dental Examiners will be held at Wrightsville Beach, Wilmington, N. C., beginning promptly at nine o'clock on Monday morning, June 21, 1915. Full information and application blanks may be secured by addressing

F. L. HUNT, *Sec'y*, Asheville, N. C.

SOUTH CAROLINA BOARD OF EXAMINERS.

THE next annual meeting of the South Carolina State Board of Dental Examiners will be held at Columbia, S. C., beginning at 9 A.M., Tuesday, June 15, 1915.

All applications must be in the hands of the secretary not later than June 5th. Application blanks and instructions from

R. L. SPENCER, *Sec'y*, Bennettsville, S. C.

MAINE BOARD OF EXAMINERS.

The Maine Board of Dental Examiners will meet in the State-house, Augusta, Me., July 1, 2, and 3, 1915.

I. E. Pendleton, *Sec'y*,
Lewiston, Me.

TEXAS BOARD OF EXAMINERS.

The next regular meeting of the Texas State Board of Dental Examiners for the examination of applicants for license to practice dentistry in the State of Texas will be held in the high school building, Dallas, Texas, beginning June 21, 1915, at 9 A.M.

No interchange of licenses with other states. No diplomas recognized. Rules governing examinations and official application blanks will be sent upon request.

All parties desiring to take this examination should send their application, accompanied by fee of $25, to the secretary not later than June 15th.

For further information address

C. M. McCauley, *Sec'y*,
434 Wilson Bldg., Dallas, Texas.

ARMY DENTAL SURGEONS.

Memoranda of Changes.

For the week ending January 16, 1915:

First Lieut. Alden Carpenter is granted two months' leave of absence, to take effect upon his relief from his present duties.

For the week ending Saturday, February 6th:

Acting Dental Surgeon Charles E. Sherwood is relieved from duty at Schofield Barracks, Hawaii, and will proceed to his home, and upon arrival at home report by letter to the Surgeon-general of the army for annulment of contract.

(Same.) Granted leave for twenty-five days, to take effect upon his arrival in the United States.

For the week ending Saturday, February 13th:

Acting Dental Surgeon Oscar G. Sketlon is relieved from duty at Fort Huachuca, Ariz., and will proceed to Douglas, Ariz., for station and duty, reporting upon arrival by letter to the commanding general, Southern department.

United States Patents

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING FEBRUARY 1915.

February 2.

No. 1,126,949, to Georges A. Brouillet. Process of filling teeth.

February 9.

No. 1,127,635, to Robert M. Kerr. Dental impression tray.

No. 1,128,045, to Gustaf Libert. Tooth-cleaning device.

No. 1,128,139, to John P. Hoffman. Toothbrush.

February 16.

No. 1,128,450, to Fernando Oscar Jaques, Jr. Selective dental disk-cutter.

No. 1,128,664, to Wm. Jamison Curry. Artificial denture.

No. 1,128,703, to Thomas G. McMahon. Artificial tooth.

No. 1,128,876, to Willis L. Hough. Partial denture and removable bridge.

February 23.

No. 1,129,335, to George A. Critcherson. Dental plate with rugæ on the lingual side.

No. 1,129,336, to George A. Critcherson. Rugæ-mold for denture plates.

No. 1,129,476, to Gustav E. Fritz. Metal backing for teeth.

No. 1,129,634, to James B. Buchanan. Wax-carver.

THE

DENTAL COSMOS.

VOL. LVII. MAY 1915. No. 5.

ORIGINAL COMMUNICATIONS.

THE TREATMENT OF INTERSTITIAL GINGIVITIS AND PYORRHEA ALVEOLARIS.

By EUGENE S. TALBOT, M.S., D.D.S., M.D., LL.D., Sc.D., Chicago, Ill.

TWO methods of treating interstitial gingivitis and pyorrhea alveolaris have recently been instituted which will bear critical analysis. The first is that of "vaccine therapy," the second "emetin treatment." As a matter of convenience we will discuss the second theory first.

EMETIN TREATMENT.

Dr. M. T. Barrett of Philadelphia first published a paper* read before the Pennsylvania State Dental Society in Philadelphia, July 1, 1914, entitled "The Protozoa of the Mouth in Relation to Pyorrhea Alveolaris."

On August 1, 1914, Dr. Angelo Chiavaro of Rome, Italy, read a paper before the American Dental Society of Europe, at Paris, entitled "Researches upon the Endamœba Buccalis."† In summing up his findings Professor Chiavaro concludes that—"The endamœba has no pathogenic action; on the contrary, as it feeds on bacteria, it is most probably an adjuvant in the autodisinfection of the mouth."

PROBLEM OF THE PATHOGENICITY OF THE ENDAMŒBA BUCCALIS.

Barrett, who was assisted in his work by Dr. Allen J. Smith, professor of pathology in the University of Pennsylvania, shows that the endamœba has been found by other scientists in different localities of the mouth. Their own experiments thus far have been confined to the contents of pyorrhea pockets, for he says: "While thus far we have found our organisms only in the contents of pyorrhea pockets, and have failed in some normal mouths to encounter them; and while, for another reason, to be given hereafter, the organisms seem distinctly pathogenic to us, it should be at once stated that these points of difference are by no means at this time of differential importance." The other reason seems to be that—

* DENTAL COSMOS, August 1914, p. 948.
† *Ibid.*, September 1914, p. 1089.

"While confident of the actual pathogenic importance of these parasites from their uniformity of occurrence and distribution, and from the evidence of their ingestion of leucocytes and erythrocytes, we did not feel justified in attempting inoculation experiments, although these are contemplated in animals in future work. It was believed, however, that evidence might be obtained in the matter of pathogenicity of the organisms by having recourse to the use of emetin, which has been found practically a specific remedy against the endamœba of dysentery within the past few years."

It will be observed that one believes that the endamœba is not pathogenic, the other that it is. In a later paper,* "Clinical Report upon Amœbic Pyorrhea," Dr. Barrett says: "As a matter of fact, in a large number of cases which have thus far come under observation, the parasites have been found present in the contents of the pyorrhea pockets almost uniformly; yet there have been a few cases in which they have not been discovered, and in any case it would be illogical to deny associated importance to the myriads of other organisms which are also found in the lesion. However, the fact of the presence of these protozoa in so large a proportion of the pyorrhea pockets, and the disappearance of the suppuration under appropriate treatment by a known amœbicide such as emetin, have served to justify the claim that they are the immediately important factors in an overwhelming number of pyorrhea cases, and that this group of cases may with propriety be denominated as amœbic pyorrhea, in contradistinction to the smaller class of cases in which they are not found, and which are due probably to other causes."

ADJUVANT IODIN TREATMENT.

Again, under the subheading "Adjuvant Iodin Treatment in Refractory Cases," he says:† "In exceptional subjects, response to the emetin treatment has been found encouraging at first, but to be limited. The quantity of pus diminishes in such cases, and the general appearance of the tissues improves. The patients invariably feel better, and there is unmistakable improvement; yet prolonged treatment with emetin does not effect a complete cure. There is obviously something more to be done, as the structures lack desirable 'tone.' One may suspect that in these cases bacteria of importance remain after the destruction of the endamœbæ by the emetin; as a matter of fact it has been found that a 1 per cent. solution of iodin in normal salt solution has usually completed the removal of the persisting condition. In the experience of the writer, but a single case of this sort has failed thus to clear up, and this instance will be more fully discussed below. The iodin application, following the use of emetin, should be employed daily, the drug being well introduced into the pockets as was the emetin. Good results should follow two or three applications."

CRITIQUE OF DR. BARRETT'S WORK.

Dr. Barrett's reasoning in these two articles, passages of which have just been quoted, would hardly inspire one with confidence either in his etiology or treatment, since he has not followed the law of Koch, which must be adhered to to obtain results. The law of Koch may be stated as follows:

(1) The organisms must be present in all cases of this particular disease.

(2) The organisms must be isolated from the disease body and propagated in pure culture.

(3) The pure culture of the organisms, when introduced into susceptible animals, must produce the disease.

(4) In the disease thus produced, the organisms must be found distributed as in the natural disease.

Dr. Barrett does not seem to have confidence in the endamœba as the cause of pyorrhea. He says, "It should be stated here that none of those who

* DENTAL COSMOS, December 1914, p. 1345.
† *Ibid.*, p. 1347.

have been engaged in this study have held or now believe that all cases of pyorrhea are due primarily or alone to the presence of the oral endamœba." Again, the treatment seems not to be satisfactory, since he says, "In exceptional subjects response to the emetin treatment has been found encouraging at first, but to be limited." He then resorts to the iodin treatment.

It has been estimated that there are at least 150 varieties of germs in the mouth. Why select one of the least harmful, according to Chiavaro, and give it all the credit for pyorrhea, and leave some of the most pathogenic as not worthy of consideration? If we use emetin and destroy the endamœba, what becomes of the other 149 germs? What shall we do with the streptococcus group, the staphylococcus group, and the pneumococcus, as well as other pathogenic bacteria in the mouth? Why spend time examining the contents of the pockets to see if the amœba is present, in order to use the emetin, when with a "Krupp siege-gun prescription of iodin" the entire 150 varieties of bacteria may be annihilated at one explosion, if it comes in contact with them?

In a specific disease, such as diphtheria, typhoid fever, and amœbic dysentery, if the cause of the disease is removed the patient gets well. Every person after the first teeth have erupted has an inflammation of the gums and alveolar process to a greater or less extent throughout life, while only 10 per cent. of all people have pyorrhea. The question is naturally asked, What causes the 90 per cent. of inflammation? After reading the two articles one is all at sea as to what is to be expected from this method of reasoning.

If, as he says, he "has failed in some normal mouths to encounter amœbæ," one naturally draws the conclusion that he did find them in some normal mouths, as others have. If he thought they were the cause of pyorrhea, why did he not inoculate animals and obtain the disease and then cure it by the use of emetin. The amœbæ, according to other observers, are also found in decay of the teeth, in the throat, and in other parts of the mouth; why will it not cure diseases of these structures?

Later investigations however, do not pan out as well, for he says that "None of those who have been engaged in the study have held or now believe that all cases of pyorrhea are due primarily or alone to the presence of the oral endamœba." Again, he says, "After using the emetin treatment the patients invariably feel better, and there is unmistakable improvement; yet prolonged treatment with emetin does not effect a complete cure." After all, he must resort to the iodin treatment, for he says, "There is obviously something more to be done. . . . As a matter of fact, it has been found that a 1 per cent. solution of iodin in normal salt solution has usually completely removed the persisting condition." Hence it will be seen that he does not consider that emetin is a specific for pyorrhea. In order to get good results the deposit must be removed from the roots of the teeth. He lays considerable stress upon this procedure. If the disease is due to the amœba, and it can be cured by the application of emetin, why remove the deposits? My experience has been that by removing the deposits alone the pus infection nearly or quite ceases. The presence of pus is a splendid diagnostic sign that the deposits are not all removed.

INADEQUACY OF THE TERM "PYORRHEA."

For more than twenty-five years I have tried to educate the dentist, and more especially the dental teachers, that the term "pyorrhea" is not the proper term to use in describing the disease of the gums and alveolar process in which there is a progressive absorption and eventually exfoliation of the teeth. I have laid particular stress upon the fact that teachers could not make clear and students could not understand the pathology of the disease by the use of this term. Only last month a prominent teacher stated in a dental society, in dis-

cussing "pyorrhea," that "In the use of emetin the pus germs are destroyed, and the disease gets well." Such ignorance of the simplest principles of pathology should prohibit him from teaching. Such loose terms have confused some of the medical profession in regard to the pathology. Since the vaccine treatment has been employed I am constantly being asked by laboratory men and practitioners to give my views in regard to the etiology and treatment of the disease, since they are at sea in regard to the nature and pathology of the tissues expressed by the term "pyorrhea."

THE WRITER'S FINDINGS.

Others have done research work upon this disease, and their conclusions should be worthy of consideration. I shall briefly state here the result of over thirty-five years' study of this disease. We have two distinct and separate conditions to deal with—first, an inflammation of the gums and alveolar process; second, pus infection. Every animal —including man—who possesses only two sets of teeth has the inflammatory process going on in his mouth throughout life, to a greater or less extent. Only about 10 per cent. of the patients have pyorrhea. Two conditions are necessary for a man or an animal to have pyorrhea—first, inflammation; second, pus germs to infect the part. Hence, although a person may have the inflammatory process going on in his mouth throughout the process of the exfoliation of the teeth, without pus germs are present, infection cannot take place. This explains why so few people have pyorrhea and yet lose their teeth.

The inflammation, which I have termed "interstitial gingivitis," may begin at the gum margin, at the apical end of the root, or at any point midway between the end of the root and gum margin, and extend throughout the length of the alveolar process. Absorption of the bone is due to the inflammatory process, and is not caries of bone.

No one up to the present time has been able to produce the inflammatory process by infection. Many, including myself, have tried it. On the other hand, I have demonstrated to my own satisfaction that the inflammatory process is due to irritation, both local and constitutional. I do not believe that pyorrhea has anything to do with the inflammatory conditions. Hence a drug may be applied and the pus germs destroyed, but the inflammation still remains. No matter what the treatment may be, the inflammation and absorption are never cured. The tooth so far as the disease is concerned is a foreign body, since arteries and nerves do not enter its structure. In order that we may understand my conclusions, we must study the nature of the tissues under discussion.

The pathologic changes which take place are due to the unique function of these structures. The evolution of the face due to environment and change of food causes the jaws to recede, as large jaws and teeth are not required for mastication. My researches have shown that formerly the jaws measured an average of 2.50 inches from the outside of the first molar to the outside of the other. Today the average is about two inches. The antero-posterior length has diminished in proportion. The result is that the alveolar process, which was once short and thick, has become long and thin. The blood supply of the jaws and alveolar process is diminished. The bone which covers the roots of the teeth, originally was quite heavy and well nourished. At the present time it is often as thin as a sheet of paper, and in some cases there is little or no bone on the outer surface of the roots of the teeth.

With this evolution of structure going on, the jaws and their alveolar processes may be called transitory structures. This, however, is not all. At birth there is no alveolar process; when the first set comes into place the process builds itself about the roots to hold them in position: when they are shed the bone absorbs away. As the second teeth erupt the bone is redeposited to a greater ex-

tent, because the roots are longer and more work is required of them. When these teeth are removed the process rapidly absorbs away. The bone, therefore, is expressly intended to hold the teeth as long as they remain in the jaws. Again we note that the alveolar process is a transitory structure. We have, then, in the alveolar process, a doubly transitory structure, very susceptible to disease. The alveolar process is an end organ. The arteries and nerves that supply the process are small and tortuous, and extend as far as the root of the tooth. The tooth, so far as the disease is concerned, is nearly a foreign body. The nerves and arteries do not enter the tooth substance. Poisons circulating in and about them set up irritation and inflammation. The higher vertebrates have only two sets; while the two sets are intended to last throughout their lives, yet there is an atavistic tendency to absorption of the alveolar process. If man could live long enough in a fairly healthy condition he would lose this second set of teeth. After the process has obtained its growth it becomes senile, so to speak, having performed its function, the art of mastication having in a sense been lost; a low vitality results with absorption, which I have called "osteomalacia." All animals possessing two sets of teeth have this disease. Dogs, especially house-dogs, are the best animals upon which to study. After this explanation of the structures and function of the tissues involved, we can understand how the slightest irritation, either local or constitutional, will set up irritation, followed by inflammation and absorption of bone as a result, which will continue until the tooth becomes loose and drops out. Place a rubber ring around the neck of the tooth against the gum: in the healthiest mouth an inflammation of the gums throughout the alveolar process to the end of the roots is the result, and if pus germs are in the mouth they will infect the tissues. The so-called "pyorrhea" is a secondary condition. Treat a patient with mercury for a specific disease —until when? Until the gums become sore and inflamed—and then stop. Why watch the gums and not the fingers or toes or other structures? Because the alveolar process is a transitory process and an end organ. Therefore the process is one of the first if not the first structure in the body to respond to constitutional irritation.

I could go on indefinitely with illustrations which have come under my observation, but enough has been given to show the relation between systemic disturbances and alveolar inflammation. In a general way, therefore, a local or a constitutional irritation such as the metal or drug poisons or auto-intoxication will start the inflammation and absorption. Germs are always present in the mouth. Infection is always a secondary consideration, and therefore cannot be the sole rôle of the disease. I am considering the cases which come to the dentist and are called pyorrhea, interstitial gingivitis, or Riggs' disease, and not such infections as tuberculosis, anthrax, actinomycosis, etc., which have other constitutional symptoms and require the care of a general practitioner of medicine. Focal infection from the mouth producing systemic disease is not considered in this paper. It seems to me, therefore, that the only influence pus infection—pyorrhea—has in connection with the disease "interstitial gingivitis" is that it is a medium through which the absorbed alveolar process is conveyed from the process and deposited upon the roots of the tooth, and is called by the dental profession "serumal deposits."

THE VACCINE TREATMENT.

After what has been said in regard to the etiology of the disease, it is useless to spend time in discussing the subject of vaccine treatment. I can only say that, so far as we know at the present time, the disease being due to irritation and not to infection. the effect of this treatment would be almost *nil*.

The first thing to do in the treatment of the mouth is to place the mouth in a presentable condition, by the application of iodin about the gums, teeth, and

mucous membrane. The number of visits and applications will depend upon the condition of the mouth and the fastidiousness of the operator. No operator is justified in placing his hands in or spending much time examining a dirty mouth.

Give the patient a gum-wash and a gum-massage brush, and request him to use both vigorously until presentable for operating. The gum-massage brush should be made of unbleached bristles to obtain stiffness. Remove all irritants, both local and constitutional. See that the patient is in good health. Place the eliminating organs in a normal condition. Deplete the gums and alveolar process of stagnant blood; stimulate the bloodvessels and nerves to a healthy action. This may be accomplished by vigorous gum massage and astringent gum-washes or by vacuum treatment, or both. This treatment will improve the health of the tissues, but will not completely cure the disease.

CONCLUSIONS.

The following points have been brought out by the author in his more than thirty-five years' research:

(1) The evolution of the head, face, and jaws has caused the alveolar process to become more susceptible to disease. The processes are longer and thinner, and the blood supply is lessened.

(2) The alveolar process is a doubly transitory structure.

(3) The alveolar process is an end organ or structure.

(4) The tooth so far as this disease is concerned is a foreign body.

(5) The alveolar process when it has completed its growth about the second set of teeth becomes senile, and a low form of bone absorption begins, and continues throughout life.

(6) The alveolar process when completed loses its vitality, the resistance is lowered, and irritation and inflammation attack the tissues.

(7) Any constitutional disease will lower the vitality of the alveolar process.

(8) The disease which attacks the gums and alveolar process is divided into the inflammation and pus infection.

(9) The inflammatory process is due to both local and constitutional irritation.

(10) Infection as a cause of the inflammation and the absorption has not yet been demonstrated.

(11) Inflammation always precedes pus infection.

(12) The irritation and inflammation may begin at the gum margin, at the apical end, or at any point between the neck of the tooth and end of the root—hence the term Interstitial Gingivitis.

(13) Every animal, including man, which has two sets of teeth, has the disease to a greater or less extent after the eruption of the first set.

(14) The nearer the animal lives to nature, the less liable is he to have the disease; on the other hand, wild animals domesticated are very susceptible to the disease.

(15) Only about ten to fifteen per cent. of humans have pus infection.

(16) Outside of calcarious deposits, modern dentistry has caused more inflammation and absorption of the alveolar process than any other one cause.

(17) Deposits upon the roots of teeth —not tartar—are the absorbed alveolar process and not "serumal deposits."

(18) The absorption of bone is a natural process and is not caries. I have called it juvenile and senile osteomalacia, depending upon the age of the patient.

(19) The disease is progressive: it is never cured in the sense that other diseases of the body are cured.

(20) The alveolar process, when once destroyed, is never reproduced after the patient has attained his growth.

TREATMENT.

(1) Use iodin to destroy germs and clean up the mouth before scaling the teeth.

(2) Use gum-massage brush and gum-wash three times a day.

(3) The soft-bristle tooth-brush is of no use in treating this disease.

(4) The gum-massage brush should be made of the stiffest unbleached bristles.

(5) The ordinary tooth-brush will not reach the gum margins.

(6) Remove all irritants, both local and constitutional.

(7) By removing deposits about the root of the tooth the pus ceases to exist.

(8) See that the patient is in good health.

(9) Place the eliminating organs in a normal condition.

(10) Deplete the gums and alveolar processes of stagnant blood. This may be accomplished by scarifying the gums and depleting the tissues while removing the deposits by vacuum treatment, and by vigorous action of the gum-massage brush.

(11) Stimulate the tissues to a healthy action.

These points have all been brought out in my researches, and have been published from time to time. They cannot, therefore, be ignored. Those who read papers or do research upon the subject of "interstitial gingivitis" and "pyorrhea alveolaris" must either indorse these statements or after a reasonable amount of research disprove them. Too many papers are read and much time wasted by essayists, who only express their views upon this subject, which makes their papers worthless.

MODERN CROWN AND BRIDGE CONSTRUCTION.

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(1) Crowns.

IN modern crown and bridge work such a great advance has been made recently that I thought at this time it would be wise to discuss some of the newer methods. For a long time I have noticed that the labial and lingual surfaces of the gum would recede at the gingival, and was at a loss to discover the cause. After years of observation I have found a logical reason for this recession. The reason is, that these surfaces, *i.e.* the lingual and labial, of the crowns were not correct anatomically. In most crowns the lingual surface is left comparatively flat, or in some instances concave, when it should be concavo-convex, the convex surface being, of course, near the gum line, and reproducing the marginal ridge. If the labial is also left convex, the crown correctly adjusted, and the root surface properly covered, there will be no recession, because the food will be deflected from contact with the gingival margin of the gum, thus shielding it from injury.

The recession of which I speak is caused by the food being driven against these tender surfaces, causing a tearing away of the gum. This same thing is true in the construction of all-gold crowns; unless they are properly contoured either on buccal or lingual surfaces, the same unfortunate condition will arise.

(2) Root Preparation.

In the preparation of the roots of the anterior teeth, instead of making a perfectly flat stump, the root should be cut concave mesio-distally to conform with

the outline of the gum margin. If this is done properly, the inflammation so frequently observed in the septal area will not occur. The reason for this inflammation is that the septal tissues are interfered with by the crown's pressing against them. Of course, it must be understood that proximal contact must be carefully carried out. In the preparation of the root for an all-gold crown, it is the exception to find a proper amount of removal of tooth structure; frequently just enough of the tooth is cut away to allow the gold to pass between the teeth and skirt out at the bottom, allowing the gold to impinge on the gum tissue. If a proper technique is followed, this operation is very much simplified. My rule is to first cut away enough of the occlusal surface to allow a proper restoration in gold. These cusps should contain a considerable amount of metal; frequently I find they are made of a single layer of No. 28 gage, the operator failing to cut away sufficient tooth structure to allow enough gold to be placed in position to make the crown sufficiently strong to resist the wear of mastication.

On the mesial side, a seven-eighth inch depressed rubber and carborundum stone is used to cut off the entire mesial surface. This cut should be made liberal, beginning about 3/32 of an inch from the point of approximal contact, and the entire mesial surface removed in one slab, the line of cut gradually diverging toward the mesial surface in such a manner as to produce the reverse of the natural tooth form. The same process is used on the distal surface; then the lingual and labial surfaces are ground away, beginning at the gingival and cutting toward the occlusal. This being properly done, we have left a stump in the shape of a pyramid, the apex of which has been previously cut off. All that remains, then, is for the corners to be rounded, which may be done with a No. 9 corundum stone; the balance of the trimming should then be done with Ivory's cervical trimmers, which I have found the most perfect I have been able to secure.

The measure is taken, and the band that is made should be larger toward the occlusal surface than where it fits around the stump. This will allow for proper contouring. After the band has been made and contoured and adjusted, it is returned to the mouth, and an impression and bite taken. This is placed in a small articulator and the occlusal surface restored in wax. When invested and cast, we are able to produce a crown far better in appearance and anatomical form than by any of the methods of stamping cusps from fixed forms.

A more perfect crown may be produced by making a parallel band of 32-gage platinum on which, after adapting to the root, is soldered a flat top of the same metal. This cap and band are placed in the mouth and an impression and bite taken; these are placed in a small articulator and the whole platinum surface covered with inlay wax by melting. This wax is then carefully carved to correct form, the cusps and bite-planes restored, and the whole invested and cast. This gives a perfect seamless crown which, for adaptation and contour, cannot be surpassed.

In the construction of the so-called Richmond crown, when the root is properly prepared, the circumference of the stump is much smaller than the natural root-end; if due allowance is not made in placing a cap on the band, we will have a surface that is abnormally small to put the porcelain facing to. This produces a very unsightly appearance, which may be obviated by allowing the cap to extend beyond the area of the band about 1/32 of an inch, trimming this band to an even extension all around. Solder is then flowed around the band to fill the triangle left by the projecting cap. This will give a normal size to the cap, allowing a proper width of porcelain at the gum line. Crowns made by this method have a better cosmetic appearance, and the gingival tissues are restored to their normal relation, adjusting themselves in such a manner as is conducive to their health.

In the adjustment of single all-porcelain crowns to the anterior teeth, I have experienced a great deal of difficulty in grinding a satisfactory joint, as well as

frequently finding that the porcelain was either smaller or larger than the root-end. To obviate this difficulty and to facilitate perfect adjustment, I have hit upon the following simple method, which obviates the necessity of casting or soldering the joint between the crown and the root-end.

We will illustrate by using a pinless crown of any make. The root-end is prepared as directed in the first part of this paper, being sure, however, to cut the root-end under the gum line, especially on the labial surface. The canal is enlarged to admit a 16-gage wire—and I have found that clasp wire is a very satisfactory substitute for platinum for such work. The end of the wire is pointed and pushed through a disk of 3/1000 pure gold. The pin and disk are placed on the tooth, and the pin pushed home. The disk is then burnished against the root-end. This construction is removed and the disk soldered to the pin with a very minute quantity of solder, returned to the mouth, and the disk carefully burnished and trimmed to fit the root-end. The wire pin is cut off, allowing about 1/8 of an inch to extend beyond the disk so as to allow a firm hold for the cementation of the crown on the pin.

The construction is removed; then an impression is made, which should include the adjoining teeth, and a model run in plaster. This model should have one coat of shellac to give its surface additional resistance. The porcelain crown may then be accurately ground to fit the gold disk, which represents the root-end, as every surface is visible. The crown should then be cemented to the disk and pin, and when the cement has thoroughly set, the whole construction is removed from the model and the joint polished of any overhanging or excess cement; the crown is then ready for cementation in the mouth.

By this method, all porcelain crowns may be adjusted perfectly to root-ends in a rapid and satisfactory manner, with the additional advantage that the greater part of the work is accomplished out of the mouth.

(3) Bridge Work.

For many years, in bridge construction the sole aim of the operator seemed to be the restoration of the labial surfaces of the missing teeth, very little attention being given to the lingual aspect of the restoration. All have observed the lack of correct enunciation, especially of the sibilants, by persons who were wearing anterior bridges, where no attempt was made to restore the individual lingual surfaces of the teeth. Such bridges cause a decided defect in pronunciation, and are far from being a satisfactory restoration. They might be likened to a building with a superb front, with noble columns, and a back containing only a hovel. It is just as important to make a correct lingual surface to crowns and bridges as it is to have correct shade and contour of the porcelain facings.

Such bridge work is readily constructed by the use of the Goslee teeth, or if it be impossible to secure them, the lingual surfaces may be restored by using any interchangeable facing, and casting lingual contour on the backing. This work requires individual saddles, but these are so readily made by casting that their construction should be no hindrance.

In the construction of the individual saddle bridge, the dummies should be constructed separately, polished to a pumice finish, and then assembled on the model and attached to each other by soldering only the incisal half, thus allowing a free space at the gingival portion between the dummies, making a restoration of the septal area. This facilitates cleansing and produces a more sanitary bridge than the old so-called self-cleanser, which, in truth, was just the opposite—a filth accumulator.

Time forbids my going into the full technique of this form of construction, but in recommending it for your consideration, I feel justified in doing so by years of careful observation and practice.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

PROBLEMS OF PAIN AND OTHER ORAL SENSATIONS.

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(Read before the Academy of Stomatology of Philadelphia, at its monthly meeting, held January 26, 1915.)

INTRODUCTORY.

THAT the mouth is the most important external orifice of the animal body is a self-evident proposition. The statement admits of no refutation. Its position at the entrance to the alimentary tract dominates the situation, for it is the *via media* which intervenes between outside conditions and that complex internal mechanism or those groups of mechanisms whose function is to sustain life. Containing no organs in themselves vital to those potential or animating principles or states of being which are designated by the word life, it is a more or less simple cavity when considered from the anatomical point of view.

Yet, regarded physiologically, present knowledge is very incomplete and scanty; and even histologically, but little is known with certainty about the nature of its confines.

In man it is a remarkable cavity, too, in the tolerance with which it—the site of much-continued traumatism, the receptacle for all kinds of foreign bodies—allows itself with impunity to suffer all kinds of abuse, such as the diurnal variations in temperature induced by constant contact with all manner of hot and cold, solid and liquid foods. The relatively infrequent occurrence of malignant diseases of the various parts of its mucous membrane is truly an extraordinary thing, if one attempts to estimate the approximate numbers of extraneous substances in the form of mechanical appliances which are being employed by many millions of people, and to take into account the amount of harm they do. As to the real nature of the properties of the mucous membranes lining its walls we have but little information. They must be remarkable, powerful, distinct from and even more delicate than those of the general integument which clothes the body—remarkable because of the limited area which they cover; powerful in withstanding injuries and diseases; different from those of the corium, for they do not govern or regulate body temperature and possess only local second-rate excretive or secretive functions which are unessential to life; and delicate, inasmuch as, by reason of being in a sense protected from outside interferences by the lips, they respond very readily to various tactile, thermal, and electrical impressions, probably more quickly than the epidermis itself.

The propinquity of sensitive and insensitive areas in the mouth is remarkable and noteworthy. For instance, the inner margins of each gingival trough, at the cervical portions of the teeth, are exquisitely painful to the touch on applying the fine point of a probe or explorer, on account of the presence in this region of the free edge of the periodontal membrane, which is here merely covered with a thin layer of epithelium; whereas the upper boundaries of the same trough and the tissues over the alveolar processes of the jaws are insensitive and practically immune to pain when receiving tactile stimulation.

A similar and familiar instance is

supplied by the relationships between the conjunctiva and the fold of the eyelid; a more remote likeness exists in the parts at the junction of the soft tissues and the bed of the nails of the fingers—the so-called "nail-groove."

If one adds to the foregoing considerations the presence in the mouth of those unique bodies the teeth, and that marvelous organ the tongue, it will be at once conceived that in this region of the body there still exists a large field for original observation, replete as it is with unsolved problems of a physiological and pathological nature, which are frequently demanding greater and greater attention on the part of the microscopist, physiologist, and pathologist.

The subject covers a vast field. Within the limits of this address it is only possible to discuss certain aspects of some problems of pain and oral sensations which, though very recondite, are of profound significance and importance.

PART I.—Physiological Considerations.

In spite of becoming accustomed to having placed within it all kinds of food, the mouth instantly, by means of the co-ordinated impulses on the part of the sensory nervous mechanism, working in conjunction with the motor apparatus of its parts, rejects any particle which is unsuited to the process of ultimate metabolism. Thus nature guards the functions of the oral cavity.

The nerves distributed to the tongue and boundaries of this cavity are not solely responsible for this rejection of improper foodstuffs; experience and the other organs of the senses, and certain centripetal aisthenic (*αἰσθάνεσθαι*, "to perceive or feel") ideas associated with them play their part.* Three illustrations from the animal world will make clear this point.

A butterfly is attracted to its food or is repelled by the sense of sight, and is therefore the subject of a largely-developed opsaisthenic faculty. It will flutter toward a colored object—say a piece of red paper lying on the roadway—thinking that it is a flower, and will as quickly fly away with disgust on discovering its mistake.

Rhinaisthenics, or osphresis, the critical olfactory sense, actuates the female mosquito, and other mature *diptera,* to attack the exposed parts of animals, including man, whence it can indulge its blood-sucking proclivities.

Coming higher in the scale of life, a dog seeks its food mainly through the exercise of its power of gumaisthenics or the sense of taste, backed by experience or the activities of memory and imagination: though of course here again the olfactory sense is an important adjuvant. A dog rejects, as a rule, the eating of such things as oysters, but an educated town-bred "toy" dog will eat them with evident relish, as well as such articles of diet as cucumber, asparagus, nuts, etc. In this respect it resembles man, who, as Sir Ray Lankester points out, "in many things is still entirely guided by unreasoning mechanical instinct, and in others is partly impelled by the old inherited instinct, partly restrained and guided by reason based on experience and memory." Experience and memory both come within the ken of an intelligent or what we call an "educated" dog.

Thus it is apparent that the aisthenic

* This term, originally suggested by the late Alfred Smee, F.R.S., in "The Mind of Man," 1875, comprises "those representations which are carried to the brain through the medium of the nerves from impressions made on the eye, ear, nose, tongue, and skin." The phrase and its derivatives are used in this paper as a distinctive expression from the more modern term "æsthetic" (or "esthetic"), which conveys a different meaning, and nowadays is differently applied. Thus esthetics means "the theory or philosophy of taste" and "the science of the beautiful in nature, and more especially in art." Further, this word must be carefully distinguished from "sthenic" and its converse "asthenic" (derived from *σθένος*, meaning "strength"). "Asthenic" is applied to the weak, "sthenic" to the strong human emotions.

and syndramic* faculties of the mind or of instinct are universally found in animals, even the lowliest, and are of the utmost importance in the search for food, and consequently the sustenance of life.

SENSITIVENESS OF THE TEETH.

As far as the dental organs are concerned, passing reference only need here be made to what I have elsewhere noted and described, viz, the several uses of Nasmyth's membrane, of the enamel, dentin, pulp, and periodontal membrane. Suffice to say that it is probably correct to believe that the physical, chemical, and histological constitutions of enamel are such as to allow it to conduct, and to prevent it from generating, sensations of any kind. It is, however, true that the sensitiveness of the teeth, taken as a whole, is extraordinary, "distinguishing, accurately and immediately, between the shapes, proportions, and constitutions of wholly dissimilar foreign bodies, such as shot in game, a crumb of bread, a delicate hair, a piece of thread—silk or otherwise—a fragment of gritty sand or particle of comminuted food; a sensitiveness which causes its rejection or retention; a sensitiveness, too, of degree, whereby differences are at once detected between the comparative softness of a small leaden bullet and the dense hardness of a piece of shell. . . . It would probably be true, however—it remains for future observation to decide —that the nervous. perceptions of a tooth are so high and so complex from a physiological point of view that the pulp may be considered to be a very special sense organ, ranking, not equally, but in some considerable degree or manner, with those other special senses of hearing, of sight, and of taste themselves."

What is a sensation? Karl Pearson ("Grammar of Science," 1900), describes it as follows: "At the brain, what we term the sense impression is formed, and there, most probably, some physical change takes place which remains with a greater or less degree of persistence in the case of those stored sense impressions which we term memories. Everything up to the receipt of the sense impression by the brain is what we are accustomed to term physical or mechanical; it is a legitimate inference to suppose that what from the psychical aspect we term memory has also a physical side; that the brain takes for every memory a permanent physical impress, whether by change in the molecular constitution or in the elementary motions of the brain substance, and that such physical impress is a source of our stored sense impression."

CEREBRAL FALLACIES.

The mind derives its conscious syndramic ideas from external impressions through aisthenic mediums. A sensation is the result of a simple mental operation, brought about by—(1) A stimulus—tactile, electrical, chemical, and so on: (2) a nerve-ending to receive it; (3) a path to the cerebrum, and (4) a center of the brain to receive the impulse and to transfer it to the seat of origin. It—the brain—sometimes makes an error of judgment. For instance, if a foot has been amputated on account of an injury or a disease, a stimulus applied to the surface of the healed "stump" frequently causes the brain to refer it apparently to the toes of that amputated portion of the limb, in which of course a breach of continuity of the parts has been made! A knock on the so-called "crazy-bone"—the ulnar nerve at the elbow—refers painful sensations to the fourth and the medial half of the third fingers!

The sensorium, through the optical

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* *Syndramic* (σύν, "at the same time," and δρᾶν, "to act") means literally "acting at the same time," and is a combination which is the result of simultaneous actions on the ultimate nervous fibrils. From the point of view of the human mind, aisthenic faculties, derived from the organs of sensation, are most highly developed during the period of youth, say from the ages of six to twelve; the syndramic faculties, derived from simple ideas, from the ages of ten to sixteen.

apparatus, actually subjectively interprets certain changes set up by pressure as *light*. If the finger presses in certain directions the eyeball with the eyelid closed, say over the external canthus of the eye, the brain notices not only the pressure, but also an illuminated ring of light—a "phosphene"—below the internal canthus. Thus it is deceived. Precisely how this occurs has not been expounded by the modern physiologist; the phenomenon was known, too, but never explained, by Aristotle.

In short, the brain generally acts involuntarily; mechanically. As F. W. Hedley says in "Life and Evolution," 1906, "The brain cannot do much, unless it works very largely automatically."

The majority of our ordinary sensations fall about the so-called "range of sensibility," of which the liminal intensity of the sensation, or lower limit of excitation, is the smallest stimulus, and the maximum of excitability, or height of sensibility, is a stimulus so great that the brain is incapable of recognizing any increase in it. This range of sensibility is governed by Weber's and Fechner's laws, which briefly state that sensations increase as the logarithm of the stimuli.

According to Halliburton, the magnitude of the fraction representing the increments of stimulus necessary to produce an increase of sensation determines what is called the discriminative sensibility, which, as far as the mouth is concerned, is for tactile pressure about one-third to one-fourth, for temperature one-third, and for weight one-seventeenth. The homologous stimuli met with in the oral cavity are those of changes produced by actual contact with a body, taste, touch, weight, and alterations of temperature by conduction, not by vibrations set up to a distance.

Original Experiments.

With the view of determining the discriminative sensibility and ascertaining the reactions of the homologous stimuli of the mouth, the following experiments were undertaken for the special purposes of this communication.

Simple experiments were conducted to ascertain the localization of parts of the cavity which were responsive to, first, slight spreading tactile impressions; secondly, localized pin-point impressions; thirdly, temperature impressions.

For descriptive purposes the palate was divided into sutural, dental, and middle regions, while the alveolar processes of the jaws provided tracts for examinations of the surfaces of the external and internal alveolar plates in the maxilla and mandible respectively.

First, the tactile sense, the oldest of all senses, from which all the others have, in course of time, become evolved:

(A) *Light, spreading impressions* were made by means of a soft camel-hair brush and also a heavier bristle brush. In both cases the results were similar.

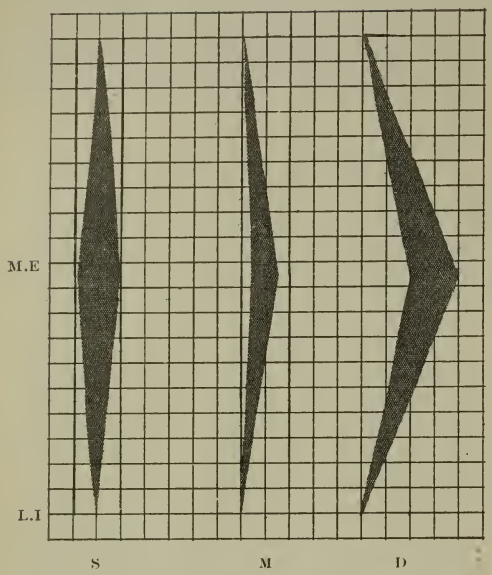
In the antero- and postero-sutural segments there was slight sensibility, in the mid-sutural segment maximum excitability. In the antero- and postero-dental regions there was slight sensibility, and maximum excitability in the mid-dental area. In the middle territory the anterior and posterior parts showed but very slight susceptibility to tactile impressions, while in the middle portions they were only slight. (See Fig. 1.)

Over the molar regions of the external maxillary alveolar plates these impressions were practically imperceptible, and noticeable to a trifling degree only over the canine and incisor regions; and over the internal alveolar plate they were noticeable only to a slight degree in every part.

In the mandible the tissues covering the external alveolar plate showed the same; but there was a variation on the opposite side of the mouth, being either sensitive or insensitive in certain localities, and those over the internal alveolar plate exhibited identical signs to those found on the maxillary internal alveolar plates.

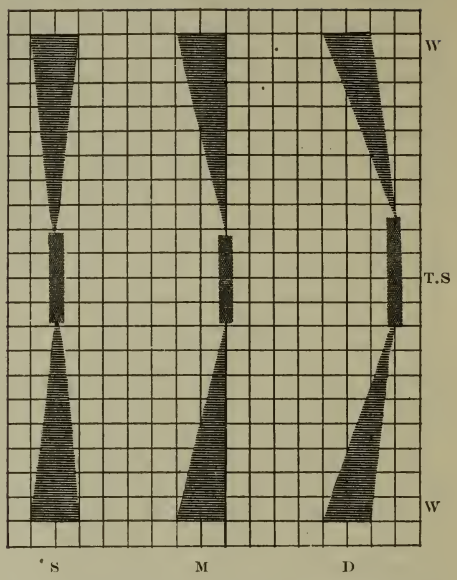
(B) *Localized pin-point impressions,* such as those produced by the Sieveking or Hammond esthesiometer. In the palate two points 1 mm. apart appeared

Fig. 1.



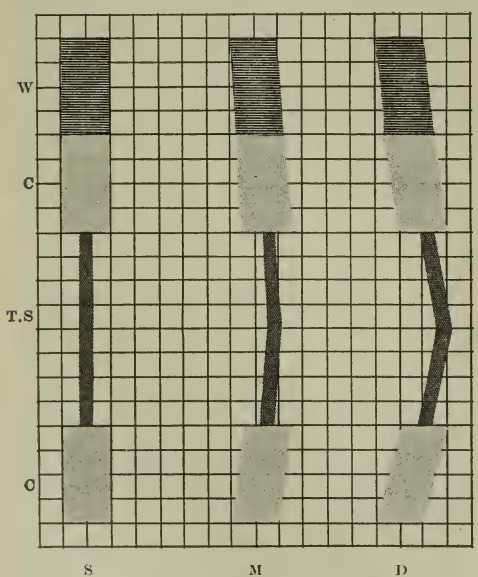
Tactile moving. S, Sutural segment; M, Middle segment; D, Dental segment. M.E, Area of maximum excitability. L.I, Area of liminal intensity.

Fig. 2.



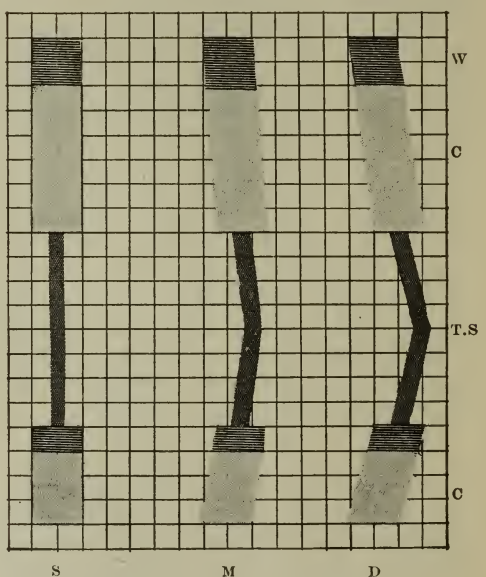
Heat moving. W, Area of warmth greatest above and below. T.S, Area of tactile sensibility. (Other lettering as in Fig. 1.)

Fig. 3.



Cold and heat moving. W, Area of warmth. C, Area of cold. (Other lettering as in Fig. 2.)

Fig. 4.



Cold and heat resting. (Lettering as in Fig. 3.)

subjectively as one distinct point; two points 4 mm. apart as two points in the incisor region, and one point elsewhere; two points 8 mm. apart were felt as two points generally, but in the molar region varied, and sometimes appeared as one point only.

According to E. H. Weber, 12 mm. is the least distance which can be measured over the "center of the hard palate" at which two points can be separately distinguished.

It is interesting to note that the distances which two points must be apart in order to set up two distinct sensations are 1 mm. in the case of the tip of the tongue, 8 mm. in the red mucous membrane of the lip, and 8 mm. in the middle of the dorsum of the tongue, while in the mid-cervical and mid-dorsal regions of the back it is as much as 62 mm.

In the maxilla both external and internal alveolar plates were tested, and yielded the same results. Thus two points 1 mm. apart appeared as one point; two points 4 mm. apart as one point; two points 8 mm. apart as two points generally, but in the premolar region appeared, on both sides of the mouth, as one point.

In the mandible the sensitive areas of the internal and external alveolar plates corresponded entirely with those in the maxilla.

Prof. E. H. Starling notes in his "Elements of Physiology," 1904, that—"It may be observed as a general rule that in those regions where the tactile sense is best developed the temperature sense is least developed. It is evidently of more importance to the organism," he continues, "that it should feel discomfort by a fall of temperature than it should by a rise of temperature, as shown by the preponderance of social contrivances, sartorial or otherwise, for maintaining the body temperature, over those for cooling the body." While this may be true for dermic territories, it will be presently apparent that, as far as the tactile and temperature senses in the mouth are concerned, the equivalence of the sensorial excitations can be satisfactorily determined by these particular experiments.

In the foregoing observations reliance was not placed solely on personal subjective sensations; fallacies would almost certainly have cropped up. The tongue fails to appreciate the real dimensions of things; a small carious cavity in a tooth seems to be an enormous chasm, a tiny almost invisible vesicle on its surface a mountain! As with regard to size, so with other perceptions; therefore objective help was sought, and the findings are those of such.

(c) *Temperature changes.* The tests for these are necessarily less delicate than those for the tactile sense, on account of the fact that cold and the radiation of heat waves from the instruments employed are apt to be felt by the lips, tongue, etc. As far as both force and sensation are concerned, the discriminative sensibility of the mouth equals, at least, that found in the center of the palm of the hand, the forearm, the plantar surface of the feet, and other parts of the body, even if it is not still more refined, and is greatly in excess of that of the thenar and hypothenar eminences of the hand.

The appended results were obtained by the use of metal pencils, each provided with an insulating holder. One pencil was warmed to 98°C., the other cooled to about 2°C.; raised or lowered above or below these degrees, pain could have been experienced.

The palate. 1. On passing the warm pencil over the sutural surface, warm spots similar to those described by Goldscheider as occurring elsewhere, were discovered at the back and over the *papilla palatina.* (Fig. 2.) The tactile sense only was discernible in the middle of this segment. These impressions remained for quite a minute after the stimuli had been withdrawn. On the external alveolar plate, in both maxilla and mandible, tactile impressions only were received on drawing the instrument over the surface; but on holding it in place in a localized position, these became quickly converted into

those of warmth. II. With two points, one hot, the other cold, at a distance of 4 mm. apart, drawn over various surfaces of the palate, the caloric sense was suspended at the back, cold only being felt, but both cold and warmth at the front. (Fig. 3.) But in regard to stationary points, both were noticed, the cold predominating. (Fig. 4.)

(D) *The weight sense* is difficult to ascertain. If a sensitive organ such as the tongue is practically unable to distinguish degrees of weight—for instance, it cannot detect the radial pulse at the wrist—it is extremely unlikely that the palate and alveolar plates could give other than negative results.

The ability to localize, as in the second set of experiments, tactile sensations, depends chiefly on the number of nerve fibers distributed to a part. According to Weber, the distance between two points is estimated, by the brain, by the number of unstimulated nerve endings which intervene between these points. "A certain number of intervening unexcited nerve endings are necessary before the points touched can be recognized as separate, and the greater the number, the more clearly are the points of contact distinguished as separate." (Halliburton.)

From this we learn that both liminal intensities of sensation as well as maxima of excitation are found in the mouth, and that, generally speaking, its anterior parts and vault are much more sensitive than those of the back and sides, this being probably due to the fact that the naso-palatine and anterior palatine nerves are particularly sensitive to caloric impressions.

Further, it is also clear that its sensitiveness exceeds that of the general integument; that its faculty of nicely distinguishing variations in the tactile and temperature senses is largely developed; and that its physiological attributes are brought about by a very similar arrangement of the end organs and touch corpuscles which are so freely distributed to the mucous membrane of the lips and certain portions of the skin itself.

ORAL ELECTRICITY.

Electrical phenomena are frequently met with in the mouth, and their recognition will often explain the occurrence of otherwise insoluble enigmas. The unexpected fracture of a 16-karat gold clasp on a denture or appliance draws attention to it. If such a band comes into close but not necessarily immediate contact with a metallic filling—say amalgam—electrical currents may be set up sufficiently strong to cause it to break, and the filling to become disintegrated.

Various parts of the mouth should be tested to elucidate these examples of oral electricity. When two metals of different electro-motive force meet or nearly meet in the mouth, electrical currents are induced, if there is an intervening electrolyte present, such as the saliva. This current can actually be appreciated by the gumaisthenic perceptions of the tongue. Two dissimilar metals placed, one close to, the other below the lingual extremity give rise to the sensation of a slightly bitter taste. If the edge of a nickel-plated mirror comes momentarily into contact with a gold filling, and the saliva is sufficiently ionized, the patient will feel a slight shock, which varies in different individuals and at different times. I believe that voltaic currents occur in every mouth, but are so slight as to be usually unnoticeable.

Mere contact with enamel or exposed dentin is not appreciated by the pulp; it is only when two dissimilar metals are brought into contact with an intervening electrolyte, and the current is completed by contact with the mucous membrane of the lip or cheek, that the current is evolved. The pain may be feeble, but at times of even a neuralgic character.

PART II.—PATHOLOGICAL CONSIDERATIONS.

Turning now from the discussion of this highly interesting subject, we pass to the consideration of the question of

painful oral sensations. Excessive excitation of the sensory nerves and undue stimulation of nerve areas, such as we have described, produce a sensation of pain. But it is more than an hypertrophied tactile or temperature sensation. There are many evidences and testimonies that it may be a distinct sensation. Some go so far as to assert that a special set of nerve fibers carries to the brain the sensation of pain.

PLEASURE AND PAIN.

Pain is but little removed from pleasure. The pleasurable delights of toweling one's back after a shower-bath are quickly turned to pain if the rubbing be done too vigorously or too long.

Sherrington and Head have devised an apparatus, to be placed upon the wrist, to show that different sets of impulses travel to the brain side by side. Thus if the hand is plunged into warm water, pleasurable sensations ensue; but, by using the apparatus mentioned, on plunging the hand into the same water pain is experienced. "The hypothesis which can be based upon this experiment"—I quote from my "Introduction to Dental Anatomy and Physiology," 1903—"would lead one to believe that the evolution of the sensory nerves in the human organism has continually been in the direction of the avoidance of giving the human being pain." Pain is a magnificent protection and warning.

At a recent meeting of the County Medical Society held in this College of Physicians, Dr. John B. Deaver said: "Doctors must learn to understand the language of pain, which, although mild, is often of the greatest value in the beginning of serious disease, when prompt treatment has the utmost benefit." The same aphorism applies also to dental surgeons.

OBSCURE FORMS OF PAIN.

It would be a matter of superfluity to deal in this paper with such evident causes of pain in the mouth and teeth as those due to inflammation of the pulp and of the periodontal membrane, osteitis, affections of the lingual nerves when set up by epithelioma, or to pressure of impacted third molars, diseases of the same, pains occasioned by inflammatory conditions of the antrum or fractures of the jaws. Rather is it the obscurer, not the obvious forms of pain, and some observations as to certain little known sensations experienced by the oral tissues, with which we are immediately concerned.

Eliminating the problems entirely connected with the tongue and sensations of taste, as not being quite germane to this subject, attention must now be directed to the teeth themselves. Why does odontalgia arise at times in apparently sound non-carious teeth?

SENSITIVITY OF THE HARD DENTAL TISSUES.

Is enamel sensitive? Is Nasmyth's membrane sensitive? Assuredly, No! Assuming that the sensations of a tissue are due to the presence in those tissues of nerve fibers or their equivalents, it can be stated that the latter is anatomically unfit for the existence within itself of a nervous system. As far as enamel is concerned it probably has no nervous supply. No one has, as yet, succeeded in indubitably demonstrating the finest nerve terminations in its substance. Römer and Morgenstein claim the existence of minute bodies similar to Pacinian corpuscles in the human enamel spindles. Their demonstrations are open to criticism. With regard to dentin, its sensitivity is well known. The work of Römer, Morgenstein, Dependorf, and Mummery must be recalled. In the non-acceptance of their views, I find myself on the side of Charles Tomes, Retzius, Huber, and others. Retzius has abundantly demonstrated the absence of nerve endings in the dentins of *Gobius, Gasterosteus, Salamander maculata, Lacerta agilis,* and *Mus;* Huber, in *Canis familiaris* and *Lepus.*

When Mr. Howard Mummery advanced his views before the Odontological Section of the Royal Society of Medicine

I contravened them for clinical, anatomical, histogenetic, and pathological reasons. The conclusions in his subsequent paper before the Royal Society did not alter my attitude. To my mind, it is inconceivable that, as stated, two nerve fibrillæ occupy each tubule. If that were so, the dentin is supplied with many myriads of nerve endings. The difficulties surrounding the inquiry are only known to expert histologists. Still, in this connection there is just an element of uncertainty which must not be forgotten. The only point of doubt on the clinical side of the problem may arise from the possibility that some molecular changes may have taken place in the dentinal nerves, if there be any, by which they may be rendered insensitive at times, in some recondite fashion.

Adhering to the belief that the fibers in the dentinal tubules, as the peripheral poles of the odontoblasts, possess the properties of sensory nerves, it appears to my way of thinking that here is a sufficient answer to the whole question of the innervation of the dentin. It is a daily common occurrence to find that many cavities are formed in the hard parts of teeth which are absolutely insensitive; that where an area of sensitiveness and pain does exist, a deeper layer of the tissue, that nearer the pulp, on removal with a sharp excavator exhibits none of these subjective symptoms. I am still content to consider that the ultimate ramifications of the non-medullated nerve fibrillæ of the pulp arborize about the odontoblasts, which in their turn act as sensation transmitters or carriers, although they themselves do not partake of the nature of nervous ganglia.

It is frequently asserted that cementum is sensitive, the argument being that the hard tissues below the necks of teeth acutely feel tactile impressions. It is an erroneous supposition, and can be explained by the fact that frequently (in 5 per cent. of sections examined for the purpose) a developmental defect exists in this region, and that instead of the dentin being covered by enamel and cementum at this spot, they fail to meet as they should do, *bout à bout*. No one has shown indubitable proof; the anatomical characteristics of cementum would not and could not allow of the existence of terminal nerve fibers in its substance. Hence it follows that the pulp alone is responsible for pain—for it is supplied with a large nerve plexus which is out of all proportion to its size, but not to its requirements.

There are many examples of the pulps of teeth causing pain when there is no obvious lesion. Occasionally the eating of very sweet or sour bodies will set up excruciating synalgia in sound teeth. Through the glosso-pharyngeal and the chorda tympani nerve sensations are felt by the brain, which as in the case of the amputated foot makes an error of judgment as to the position of the stimulus. In its essence it is akin to mysophobia and certain other systemic morbid emotivities.

Reverting for a moment to this question as an aid to the proper understanding of this reflex act, we know that mysophobia, or the fear of improper or inapposite contacts is not confined to manifestations in the form of a natural aversion to touching disagreeable bodies, or those capable of undergoing decomposition. Many people cannot bear to perceive, by the sense of touch, the surface of fabrics such as velvets or silks, or the external parts of the skins of fruits such as peaches. There may arise in the minds of some fear of contact with metallic objects, such as copper, pins, and needles, or, according to Morselli, pieces of glass. It is possible that derangements of the tactile digital sensibility are partly the cause, for Marcé has described a case in which, through a fear of seeing pins or needles adhering to the fingers, complete insensibility of the skin of the hand was produced. Among other illustrations of systemic morbid emotivity, Morel, quoted by Dr. Charles Féré in his "La Pathologie des Emotions," cites the following: King James II of England trembled at the sight of a naked sword; Erasmus suffered from febrile fits on seeing a plate of lentils; Scaliger was

seized with nervous tremors at the sight of a carafe of water; Bacon experienced the state of syncope during every lunar eclipse.

"SETTING THE TEETH ON EDGE."

The complex series of phenomena constituting that anomaly of sensibility popularly spoken of as "setting the teeth on edge" may perhaps be placed in the same category as the preceding illustration, for, in this case, it is partly the outcome of an innate antipathy on the part of the individual. It is something more than a mere reflex act, inasmuch as it is accompanied and complicated by a mentality which is the effect of the workings of a higher conscious cerebration. This syncinesia, among others studied by John Hunter, Müller, and Gubler, which is purely physiological or perhaps borders on the abnormal, may be caused partly by the action of the auditory nerves and partly by the gumaisthenic or somaisthenic perceptions of the person.

Gumaisthenic perceptions. The phenomenon was known to the Prophets of old whose words recorded in the Bible are as follows:

> Prov. x, 26: As vinegar to the teeth, and as smoke to the eyes, so is the sluggard to them that send him.
>
> Ezek. xviii, 2: What mean ye, that ye use this proverb concerning the land of Israel, saying "The fathers have eaten sour grapes, and the children's teeth are set on edge"?
>
> Jer. xxxi, 29, 30: In those days they shall say no more, The fathers have eaten a sour grape, and the children's teeth are set on edge. But every one shall die for his own iniquity: every man that eateth the sour grape, his teeth shall be set on edge.

Ousaisthenic ideas. Shakespeare declared:

> I had rather hear a brazen canstick turned,
> Or a dry wheel grate on the axle-tree;
> And that would set my teeth nothing on edge,
> Nothing so much as mincing poetry.
> —*1 Henry IV*, iii, 1.

Through the action of the auditory nerves the grating of a dry wheel or stick of schoolboy's pencil on his slate induce it; and not infrequently the tactile sense. When the fingers are rubbed lightly on the surface of a piece of velvet, this curious sensation of pain in the teeth is noticed. Somaisthenic ideas become converted into a modified form of acute odontalgia. If the fingers are rubbed on a piece of glass-paper or a hot metallic surface, the mind appreciates the condition thus induced locally, and pain is felt, not in the teeth, but in the digital extremities themselves.

The explanation of the conversion of the somaisthenic perceptions into pain would seem to be the following:

The simple act of touching the velvet does not *per se* induce pain, and would not do so if the mental attitude of the individual were not an anticipatory one. He has the knowledge that his teeth will ache, and that possibly a cold tremor will pass down his spine, as his fingers are brought into contact with the velvety field. It may be that the brain is unaccustomed to determine the amount of muscular effort set up by the digital movements, or that it is disturbed by the unusual and somewhat naturally repellant act. There is no doubt that there is a great limitation to the capacity of the synthetic action of our minds in appreciating the changes which occur within our bodies, and the mechanism of the brain frequently fails in its estimation and correct interpretation of what is going on.

UNUSUAL FORM OF TRIGEMINAL NEURALGIA.

Bordering upon the line between physiological and pathological pain is a rare affection or disturbance—not a disease—of the fifth nerve, similar perhaps in origin to hemicrania, due to hyperemia of the vessels in the cerebrum. Hughlings Jackson says one form is due to digestive derangements. Here change in the feeding customs of an individual—digestive changes or altered constructive metabolism, due to a newly acquired fasting or semi-fasting habit, may, and do often set up pain in the

jaws and teeth, which puzzle the dental surgeon when called upon to diagnose and treat them. The pain is not restricted to Head's areas; these do not help in the diagnosis. Located and limited to one side of the face, curiously it is always the same side or alternate sides of the face which is affected, as if one of the pairs of the fifth nerve was more susceptible, for some reason, to these changes, and as if the brain was content in indicating the presence of a deep-seated disturbance only by one and not by two routes. It spreads over a large area, not the mastoid region nor the concha of the ear. It is increased on deep pressure outside, over the root of the tongue. The pain is heavy, dull, spontaneous, persistent, deeply planted, apparently in the body of the mandible and maxilla and cheek of one or other side. The soft palate, tongue, and tonsils are unaffected. It may last for a half-hour or less and disappear. No maximum spots of intensity are noticed. Digital pressure increases it; hot and cold objects have no effect, though cold may at times relieve it; pressure as from a soft substance—like a cushion or pillow—produces an exacerbation. It may be accompanied by intermittent frontal headache.

The teeth are hypersensitive. A cold finger gently passed over their crowns increases it; pressure and percussion do not. Occlusion of the opposing teeth does not. The dental surgeon may be deceived by the presence of fillings in the teeth. If they are showing signs of wear or loosening, he will probably remove them and insert others, frequently flooring the cavities with a non-conducting material, or even going so far as to devitalize the pulp of a tooth, all, much to his chagrin, being of no avail to stop the pain.

Excluding migrain, the origin of the trouble appears to be anemia or metabolic disturbances of the sympathetic nervous system, due to slight temporary gastric derangement set up by slight malnutrition or la grippe. A full, easily digested meal will usually act like magic, and relieve the pain, while the exhibition of drugs, such as acetophenetidin in five-grain doses, is also indicated. Tonics and general attention to health will also bring about like results; but in any case it takes time to effect a cure.

Thus the answer to the first problem is partially given; but to complete it one must consider even more definite conditions.

OTHER CAUSES OF PAIN.

Pain arises obviously through some intrinsic vascular changes in the pulp. An elevation or depression of the blood pressure more or less suddenly brought about will cause it.

Pain in sound teeth, due to these vascular disturbances, may be found in women at the periods of puberty, menstruation, and the climacteric. There are many proofs of this fact. Patients will complain of severe odontalgia in teeth which exhibit no visible signs of disease or injury.

An alteration in the character of the chemical constituents of the blood also may set it up. I described in the pages of the DENTAL COSMOS seven years ago an instructive and remarkable case, where the exhibition of calcium lactate to supply a reduction in the amount of the calcium content in the plasma, cured the persistent acute odontalgia in a child of fourteen years. Associated in this particular instance with this deficiency was a structural modification of the teeth only revealed on microscopic examination, which showed an abnormally small though healthy pulp bounded by an extraordinarily thick dentinal wall.

The pressure of pulp nodules on the nerve trunks of the pulp will also occasion it, and may be suspected by the dentist, should they be unidentified by roentgenography, if the patient is inclined to the rheumatic or gouty diathesis.

CONCLUSION.

This paper is the outcome of personal experience and observation. In the First Part there have been narrated some original experiments which, though not

pretending to be complete, are entirely new, save that, years ago E. H. Weber, when noting the localization of tactile spots on the surface of the body generally, found that at the center of the palate two points must be separated by a distance of 12 mm. to appear as two distinct sensations. I have ascertained that a distance of 8 mm. is sufficient.

I have endeavored to add a slight contribution to our common store of knowledge about the mouth, and particularly its discriminative sensibility—one aspect of its functions which has been but little investigated. This may not seem to be of much moment, but assuredly we should get to know as much as we possibly can with regard to the teeth and their associated parts.

Summing up Part II, it may be stated in general terms that there is no local dental lesion if reasonably hot and cold drinks and foods can be taken into the oral cavity without inducing any local reaction of pain; and that it is clear that if no obvious cause of odontalgia is present, such lesion must be looked for elsewhere. Hyperemia of the pulp is indicated, and may be diagnosed if pain is experienced at a localized situation on taking warm fluids, especially if a breach of enamel or dentin is discovered.

If this examination fails, and if pain still persists, the tongue may next be suspected and thoroughly inspected and tested; then general constitutional causes —vascular disturbances due to puberty, menstruation, the climacteric, pregnancy, etc.—conjectured; and finally degeneration, calcarious infiltration, and other retrogressive conditions of the dental pulp may be diagnosed and suitable therapeutic measures taken accordingly. The prompt recognition of these latter changes will be convincing alike to patient and dental surgeon, and the solution of some problems of pain and other oral sensations satisfactorily determined.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

STERILIZING THE HYPODERMIC SYRINGE BY BOILING.

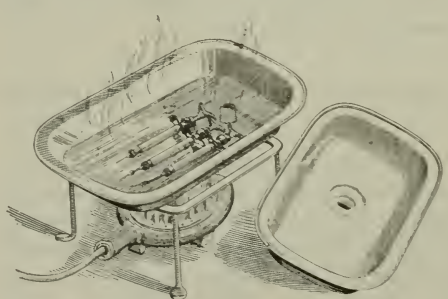
By J. L. ELPHINSTONE, D.D.S., L.D.S., Aberdeen, Scotland.

ASEPSIS is among the most important requirements of local anesthesia. There are unlimited possibilities of infection in the hypodermic syringe.

Two methods of sterilization are possible, boiling and immersion in antiseptic fluid, and as writers have of late favored the immersion method, the object of the present paper is to point out the superiority of the boiling method. No one will contend that immersion is simple, easy, and rapid, or that the method is fool-proof, while for boiling all these claims can be made.

TECHNIQUE OF STERILIZATION BY BOILING.

The following is the technique of sterilization by boiling: An ordinary porcelain-enameled iron chafing-dish with cover is obtained, such as is used in every household for baking puddings,



etc.; also an iron stand and a suitable gas burner for heating (see figure).

All-metal syringes of the well-known

Imperial pattern are used. The leather washers are removed, also the leather piston packing, as this material is destroyed by boiling.

REPLACING LEATHER WASHERS BY TIN FOIL.

The leather washers are replaced by others cut from tin foil of suitable thickness. This metal is an ideal material for making the joints water-tight, as it possesses just the right hardness. The problem of replacing the piston leather packing is more difficult to solve. Nothing is quite so soft and agreeable to the touch as greased leather.

REPLACING PISTON LEATHER PACKING BY ASBESTOS FIBER.

Fiber asbestos is, however, very good. It was suggested to me by Messrs. Ash. The loose fiber is packed tightly around the piston in the groove provided for the purpose. No lubricant should be used; vaselin or other grease only fouls the syringe inside. The moisture absorbed and retained when the syringe is in use is a sufficient lubricant. At first this packing is just a little harsh, but it soon becomes easier working, and almost as soft to the feel as the leather.

Thus prepared, the syringe requires only boiling to secure asepsis, and is then ready for use. The metal syringe has the advantage also that it can be warmed just previous to use, by holding over the Bunsen flame, and the anesthetic can thus be brought in a ready manner to blood heat.

COMPOSITION OF LIQUID FOR BOILING SYRINGES.

The next important point is the composition of the liquid in which the syringe is to be boiled. If iridio-platinum needles are used, clean tap-water will answer all purposes, and I can see no reason for using distilled water. This altogether depends on whether the small quantity of alkaline material which such water may contain is harmful, a question we shall discuss at some length presently.

If steel needles are used, a small quantity of sodium bicarbonate or some other alkali must be added to the water, one grain to the ounce, or as much as can be lifted on a twenty-five-cent piece to the pint will suffice. This is to prevent corrosion of the steel. The syringe should be totally immersed—a protruding needle will rust. A little of the fluid is drawn into the syringe, which is then boiled for ten minutes. Since the adoption of conductive anesthesia, there is no accident more likely than the breaking of a long thin needle in the tissues in a situation where its removal would not be easy. It is necessary, therefore, to be quite sure of the needle each time, and this is best accomplished by making it a routine practice to examine the needle just previous to insertion. The few drops or less of solution of sodium bicarbonate which adhere to the syringe do not precipitate the weak solution of about 1½ per cent. of novocain hydrochlorid with suprarenin, such as is used in dental anesthesia.

EFFECT OF TRACES OF SODIUM BICARBONATE ON NOVOCAIN-SUPRARENIN SOLUTION.

We must examine this matter at some length, as the contrary is a belief widely held. Sodium monocarbonate, Na_2CO_3, is a more serious precipitant, and the monocarbonate forms on boiling the bicarbonate solution:

$$2NaHCO_3 = Na_2CO_3 + CO_2 + H_2O$$

To set the matter at rest, a 1½ per cent. solution of novocain hydrochlorid, with suprarenin hydrochlorid, just as used for anesthesia, was prepared with normal saline solution. On taking a syringeful—2 cc.—of this liquid, and adding to it 5 minims of a 1 : 200 solution of sodium bicarbonate, which is as strong as the sterilizing liquid could become even after long boiling, no precipitate was obtained.

Taking a fresh portion of the same

solution and adding 5 minims solution of sodium monocarbonate—1 : 200 of the dried salt—again no precipitate could be obtained. These experiments closely copy what happens when the anesthetic solution is drawn into a syringe which has been boiled in a solution of sodium bicarbonate. The small residue adhering to the syringe is never enough to cause precipitation of the anesthetic salts. It is apparent that precipitation depends on whether there is enough water to retain in solution the bicarbonate, carbonate, or possibly free base of the alkaloids novocain and suprarenin, which is formed; and experience proves that this is always the case, unless alkaline solutions of excessive strength are used. In any case, the anesthetic is subjected to analogous influences as soon as it mingles with the lymph or blood serum, both of which fluids are alkaline.

We are therefore justified in concluding that it is only necessary to empty the syringe of the sodium bicarbonate solution, but quite unnecessary to further cleanse it by drawing in and ejecting sterile distilled water. Thus we are saved one process in an already elaborate procedure. This is all the more important since only repeated and prolonged cleansing could remove the last trace of alkali if such were indeed injurious.

The following correspondence will be found of interest. The Saccharin Corporation of London, agents for the sale of novocain in the United Kingdom, issue a leaflet from which I quote as follows: "The sterilizing of syringes with an alkaline disinfectant must be avoided, as novocain is precipitated by the slightest trace of alkali."

In answer to a letter asking their grounds for making this statement, which I informed them was not in accordance with my experience, I received the following interesting reply:

> In reply to yours it is within our own experience that unsatisfactory results with novocain have been traced to the use of alkaline disinfectants for sterilizing instruments, and that when their use had been given up complaints had ceased. Our consulting chemists are Messrs. Helbing and Passmore, 81 Queen Victoria st., London, E.C., who write as follows: "It is a well-known property of novocain that the commercial salt—the hydrochlorid—is easily dissociated by alkalis. With liberation of the free base, which is insoluble in water, with caustic alkalis, and carbonate of soda or potash, dissociation takes place, in the cold; with bicarbonate if the solution is boiled. If to a cold 1 per cent. solution of novocain hydrochlorid half the volume of 1 per cent. sodium bicarbonate be added, the solution remains clear; but on boiling, as the carbonic acid escapes, an oily scum appears on the surface, and eventually globules of melted novocain base separate. Practically the whole of the novocain is thrown out of solution, and if excess of alkali be present, further decomposition of the base takes place. At any rate it is impossible to obtain a uniform solution for injection."

The above letter fairly represents the evidence on which is based the case against alkalis.

I repeated the above described experiment, boiling together one syringeful—2 cc.—of a 1 per cent. solution of novocain hydrochlorid with 1 cc. of a 1 per cent. solution of sodium bicarbonate. The precipitate of novocain base was duly obtained, but it was noticed that there was great evaporation of the water during the process. Accordingly, distilled water was added to make up the original volume, when the precipitate redissolved; the contents of the test tube again became clear. The conclusion is therefore justified that in weak solution precipitation does not occur. In the case tested, our solution of sodium bicarbonate was one-third of the total volume, amounting in a syringeful to about 10 minims, and of a greater strength than is required for the sterilizing fluid. The above remarks about sodium bicarbonate apply in full to the sodium monocarbonate, since the former changes into the latter salt on boiling. Moreover, I do not find that a trace of alkali has any immediate bad effect which interferes with the constitution or action of the suprarenin within the short time it remains in the syringe previous to injection.

A few drops of a 1:200 solution of sodium monocarbonate were added to 2 cc., a syringeful, of a 1 : 50,000 solution of suprarenin hydrochlorid—the strength commonly used for injection. Neither precipitate nor discoloration were observed, and on injection the blanching of the gum was the same as usual. In order to confirm the deductions from this experiment, the same experiment, with a like negative result, was also tried with a stronger, viz, a 1:10,000 solution of suprarenin hydrochlorid. However, I most decidedly admit and emphasize that, as pointed out by Drs. Fischer and Riethmüller, undesirable decomposition would have taken place if the alkaline solution had been boiled or kept for any length of time. However, the important fact is that no immediate decomposition was evident.

RINGER SOLUTION VS. NORMAL SALT SOLUTION.

Lately, Dr. Fischer has recommended what he calls modified Ringer solution for dissolving the anesthetic salts.

Ringer solution modified by Fischer:

Sodium chlorid,	0.5
Calcium chlorid,	0.04
Potassium chlorid,	0.02
Aqua destillata, q. s. ad	100.0

The above solution contains one ingredient, calcium chlorid, which is precipitated by sodium monocarbonate:

$$Na_2CO_3 + CaCl_2 = 2NaCl + CaCO_3$$
Calcium carbonate (insoluble)

Accordingly, if we adopt this formula, we must give up the bicarbonate of sodium, and use iridio-platinum needles.

Personally, I adhere to the steel needles and the bicarbonate of sodium, and still dissolve my anesthetic salts in normal sodium chlorid solution. The formula for injection is therefore as follows:

Novocain hydrochlorid,	1.0 or 1.5 or 2.0
Suprarenin hydrochlorid,	0.002
Sodium chlorid,	0.7
Aqua destillata, q. s. ad	100.

STERILIZATION OF ACCESSORY INSTRUMENTARIUM.

Glass cups are often used for holding the anesthetic liquid to be drawn into the syringe, but porcelain cups, which can be boiled in the sterilizer together with the syringes, will be found better, since they will not be fractured by the heat.

A jug of water, sterilized by boiling and allowed to get cold, should be kept at hand for cooling the syringes rapidly if they are required quickly for use before they have time to cool in the ordinary way. The cold water is poured over the syringe held by a forceps.

Forceps, etc., for handling the syringes and cups, and lifting them from the sterilizer should be kept immersed near the sterilizer in a dish of about 2 per cent. lysol solution, or any other suitable antiseptic. Each time after use the syringes, etc., are boiled about ten minutes.

Dr. R. W. Goadby, in Bennet's "Science and Practice of Dental Surgery," states: "For forceps, elevators, and other surgical instruments, boiling for three or four minutes in water with 1 per cent. sodium carbonate is the best, as practically no spore-forming bacteria are to be found in the mouth, and if due care is taken in the way of common cleanliness, no sporing organisms should come in contact with them."

As, however, our piston packing is a poor conductor of heat, it will be safer to give the syringes longer than three or four minutes' boiling. In conductive anesthesia, when more than one injection is to be made with the same syringe, it will be found feasible to return it to the sterilizer, boil, and make another injection, without undue loss of time, if the water in the sterilizer has been kept ready at the boil. In this case the above-mentioned three or four minutes will suffice, since contamination can occur only on the outside of the syringe.

Goadby's proportion of 1 per cent. of sodium bicarbonate is unnecessarily strong for syringe sterilization, although unobjectionable for the instruments

which he names. I have always found 1 grain to the ounce—1 : 480—adequate for this purpose.

STERILIZATION OF THE MOUTH.

There is another factor, the sterilization of the mouth itself as a whole, which is helpful in preventing the gross contamination above mentioned. For this purpose the patient may rinse the mouth with solution of perchlorid of mercury, 1 : 2000 or 1 : 1000. For severe operations in very filthy mouths the stronger solution should be used, since every other consideration must yield to the need of asepsis. Of course this solution cannot be used in the presence of any extensive gold work, such as bridges, since the metallic mercury would be deposited thereon, and discolor the gold. The galvanic taste would also be very disagreeable. Some authorities warn us against using so poisonous an antiseptic. Asepsis, however, is all-important, and I have never been able to understand this objection. Miller declared it the most efficient antiseptic in the mouth; and we want the most efficient. Since the period for which a mouth-wash can be retained in the mouth previous to operation is necessarily very short, a weak antiseptic in such circumstances will not answer our purpose.

When the use of perchlorid of mercury is not desired, the next best antiseptic mouth-wash is the hydrogen dioxid, 3 per cent., diluted with an equal volume of hot water to make it tepid. The patient is handed about 2 ounces of one of these mouth-washes in a colored glass to distinguish it. He is directed to use it mouthful after mouthful until it is finished, working each mouthful well through the teeth, and finally ejecting it into the spittoon. He is warned not to swallow any. The dioxid froths so much that plain water must afterward be used to get rid of the froth, which would obscure the field of operation. When the mouth as a whole has been thus cleansed, the field of operation, and especially the point of injection, is rubbed with a swab of cotton impregnated with tincture of iodin. We thus insure special sterility in this important locality.

If the operation in hand is a large one, the burning taste of the tincture of iodin may be objectionable on account of the large quantity of alcohol it contains. Besides, in the mouth, the fluid naturally present negatives the chief *raison d'être* of the alcohol, viz, the readiness with which it dries. In this case the following watery solution of iodin answers better:

Iodin,	1 part
Potass. iodid,	1 "
Water,	40 parts

The iodin and the potassium iodid are rubbed with a small quantity of water in a mortar until dissolved, then the rest of the water is added.

This solution can be much more freely used than the tincture. Its taste is much less unpleasant. It stains the gum as dark a brown as the alcoholic tincture, and is presumably therefore as efficient an antiseptic, and as readily absorbed into the mucous membrane. While it is granted that the alcohol is also an antiseptic, in the mouth it is so immediately flooded by the copious saliva evoked that its antiseptic influence is negligible, except when it is applied in small quantity in a restricted area which can be kept dry.

USES AND ADVANTAGES OF THE X-RAYS AS AN AID TO DENTAL DIAGNOSIS, INCLUDING THE DIFFERENTIATION OF THE RADIOGRAPHIC APPEARANCE OF NORMAL AND ABNORMAL TISSUES.

By HOWARD R. RAPER, D.D.S., Indianapolis, Ind.

(Report presented to Section IV, Sixth International Dental Congress, London, 1914.)

FIRST let us consider the "Uses of the X-rays as an aid to dental diagnosis," then "Advantages," and lastly, the "Differentiation of the radiographic appearance of normal and abnormal tissue."

USES OF THE X-RAYS IN DENTAL DIAGNOSIS.

The radiograph is an aid in diagnosis in practically all cases of pathologic or abnormal conditions of the jaws, because all pathologic changes or abnormal conditions involve some alteration of normal density of the parts. If this variance from normal density is sufficiently definite, it will register on the radiographic film or plate.

Giving this report in accordance with the rules governing its length, it will not be possible to go into a detailed enumeration of the uses of the radiograph as an aid in diagnosis. We may summarize them as follows: (1) in cases of unerupted or missing teeth. (2) In cases of supernumerary teeth. (3) In cases of partially formed teeth. (4) In cases of pulp nodules. (5) In cases of alveolar abscesses. (6) In cases of tumors. (7) In cases of pyorrhea alveolaris. (8) In cases of necrosis. (9) In cases of disease of the antra. (10) In cases of fracture. (11) To locate foreign bodies. (12) In research work.

Though this summary covers the field fairly well, a casual reading of it will not give the man unacquainted with the subject the correct idea of the almost limitless application of the X-rays as a diagnostic aid. Take the one use, *in cases of tumors,* for example; unless you pause and consider the matter, you will not realize that this includes cases of odontomata, cementomata, osteomata, cysts, and others. Likewise the bland statement—*in cases of alveolar abscess* —gives no idea of the countless circumstances under which the radiograph proves of assistance in diagnosis in such cases. I would also call attention to the fact that we are considering the X-rays as an aid in diagnosis only, not as an aid in the practice of dentistry. To consider the X-rays as an aid in the practice of dentistry would open the big field where the radiograph is used by the operator as an aid in his operative work rather than as a diagnostic aid.

Of all the uses of the radiograph, none seem so important to me, at the present time, as the one *in research work.* The use of the radiograph will finally prove or disprove the contentions of Dr. William Hunter, as set forth in his several papers, but particularly his paper, "The Rôle of Sepsis and of Antisepsis in Medicine," read in 1910; and a careful, honest, scientific consideration of the possible effects of oral sepsis is the most important problem the dental profession has ever faced. If it is true that chronic dento-alveolar abscesses may cause such diseases as arthritis, anemia, endocarditis, and other grave constitutional diseases, then the practice and standing of dentistry will be revolutionized. The radiograph will be used extensively in

this oral sepsis research work. Thus its use is closely linked with the solution of the most serious problem which confronts us.

ADVANTAGES OF THE RADIOGRAPH AS AN AID TO DENTAL DIAGNOSIS.

There is a story told of two policemen who dragged a dead horse along Piccadilly several hundred yards to Bond st. The reason for this laborious transfer of the inanimate beast from one street to another arose from the necessity of making a written report, which involved a statement as to the whereabouts of the animal, coupled with the policemen's inability to spell Piccadilly. The advantages of the radiograph as an aid in diagnosis are often analogous to the advantage a knowledge of how to spell Piccadilly would have been to the policemen.

It has not been, however, the policy of the writer to resort to any of the artifices of writing to prove the advantages of the radiograph as an aid in diagnosis, or to consider the matter in the abstract at all, in fact, but rather to give evidence of the advantages, and let that evidence stand or fall of its own weight. It would be unfitting that I should attempt to cite in this report a number of cases which would prove the advantages of the X-rays in dental diagnosis. Evidence of its recognized value may be shown, though, by observing the manner in which American colleges have made radiography a part of their curricula. In 1910 but one or two of the approximately fifty American dental colleges taught the subject. In 1913 over one-third of the colleges were either teaching or making efforts to teach dental radiography. As this is written, March 1914, I am still receiving replies from letters sent to the colleges which are members of the American Institute of Dental Teachers. To date I have received thirty-two replies. Of the thirty-two which have answered, twenty-eight colleges teach the subject; four do not. Thus it will be seen that the value of the radiograph is rapidly being recognized by our educational institutions.

I cannot pass the subject of the advantages of the radiograph as an aid in diagnosis without calling attention to the fact that the good derived from its use depends very much on the manner in which it is used. It is unfortunate that it is not always used in vain by the man who has no idea of the etiology of the patient's malady, and makes or has made radiographs expecting them to reveal, as on a written page, the disease, its existing cause, and a paragraph or two describing treatment. I say it is unfortunate that the radiograph does not always disappoint this man who expects too much of it, who forgets all other methods of diagnosis, and lazily depends on the radiograph to do all his diagnostic work for him. It is unfortunate because it leads men to believe that the radiograph has arrived to replace all other means and modes of diagnosis, when in reality it has come not to take the place *of*, but to take its place *with* the probe, the history, the symptoms, the signs, and diagnostic tests.

A tentative diagnosis should always be made before the case is radiographed. Thus, for example, from the signs and symptoms, you may suspect a case of pulp nodules. Radiographs are made to verify or disprove this diagnosis. If the diagnosis is verified by the radiograph a great element of doubt as to the correctness of his diagnosis is removed from the diagnostician's mind. If the tentative diagnosis is disproved by the radiograph, an important step has been made in diagnosis by elimination.

Another example: From signs, symptoms, probing, and tests we make a diagnosis of alveolar abscess of an upper canine. A radiograph is made, and we learn that we have not only an abscess of the canine but of the first bicuspid also. The radiograph has verified our diagnosis and elaborated on it.

To epitomize: If you would derive the greatest benefits from the radiograph, use it only to verify or disprove and to elaborate on tentative diagnoses.

DIFFERENTIATION OF THE RADIOGRAPHICAL APPEARANCE OF NORMAL AND ABNORMAL TISSUES.

To be able to differentiate between the radiographic appearance of tissue with any degree of skill, a man should know first the general elementary principles of making radiographs; second, the anatomy of the parts; and third, the pathology of the parts. Nor is this knowledge alone sufficient. To it must be added experience in reading radiographs. Every radiograph is the product of known chemical and physical laws. Misinterpretation of radiographs is due to some lack of knowledge or illogical deduction. The assertion that the radiograph is fallible is misleading. It is our ability correctly to interpret radiographs that is fallible, and our unwillingness to recognize the limitations of radiographs that leads us to assert that we see things in them which they cannot or do not show.

Some of the more common misinterpretations of radiographs are:

(1) To mistake the anterior palatine foramen for a dento-alveolar abscess of an upper central incisor.

(2) To mistake the mental foramen for a dento-alveolar abscess of a lower bicuspid.

(3) To mistake the maxillary sinus for a dento-alveolar abscess of the upper bicuspids or molars.

(4) To assume, from the appearance of single radiographs—not stereoscopic radiographs—that the roots of teeth penetrate into the antrum, when the appearance as of this condition may be due to distortion or lapping of the roots to the buccal or lingual of the antrum.

(5) To mistake the mandibular foramen for osteoporosis due to disease.

(6) To mistake a small cervical filling for a pulp nodule.

(7) To assume that a canal filling in an upper tooth fails to reach the end of the root when this appearance of a faulty canal filling is due to the relative positions of tube, film, and tooth at the time of exposure.

CONCLUSION.

In conclusion, I would say that the X-rays are the most valuable of all our means of diagnosis. Yet this very value seems destined to cause them to fail in their greatest possible usefulness. Men will depend upon them too much, be disappointed, and then condemn them as altogether unreliable. Let us face the fact, in future, that the X-rays will not assist us to a definite diagnosis in all cases, and that unless we exercise the keenest judgment they are often misleading. For, like all other things in the world, they have their limitation and their faults, but withal they remain our greatest single aid to dental diagnosis.

FACTORS OF IMPORTANCE IN THE CONSTRUCTION OF CAST GOLD INLAYS.

By MARCUS L. WARD, D.D.Sc., Ann Arbor, Mich.

(Read before the Toronto Dental Society, February 15, 1915.)

WHEN Dr. Weston A. Price presented a paper to this society on October 27, 1908, entitled "The Detailed Technique for Making Dental Restorations on Artificial Stone Models," he was asked, according to the reports of the meeting, the following question by Dr. Capon: "In referring to that part of the paper where the essayist alludes to restoration in a mesial and distal filling united in one piece through the occlusal surface, he says the contraction will prevent its going to place, and to force it means simply to spread it out at the gingival margins, like the spreading of a horse-shoe. I would like the essayist to explain how Dr. Taggart got such fine work by his methods, and I know from personal experience that dozens of such inlays have been cast and placed into the cavity without that spreading and would bear the closest inspection."

UNCERTAINTY REGARDING THE SUCCESS OF GOLD INLAYS.

The records do not show that Dr. Capon's question was answered at that meeting, nor at any time since by the essayist of that evening, or fully answered by anyone else since that time. The writer has been asked essentially the same question as the one asked by Dr. Capon so many times within the last five or six years that he is certain that, while a great deal has been done along this line of work and a considerable amount written, there prevails a feeling that Taggart's gold inlays have never been excelled by the use of the stone model suggested by the essayist of that evening, by the use of other materials for the cast inlay, or by making use of the results of some valuable scientific research along this line of work. Those to whom Dr. Capon referred that evening have, I believe, continued from that time to the present to insert as beautiful inlays as they did then, and have found but a partial application for many of the theories advanced relative to this work that were not in harmony with the ones they were already practicing. That a most beautiful result is possible in almost every case is the belief of many, but the majority feel that there is an element of uncertainty connected with the construction of about every case they do. This condition of uncertainty, which in many cases is probably due to nothing more than faulty technique, is exaggerated oftentimes by the conflicting opinions that so often appear in the current literature. With the feeling that he has been in a position to investigate the merits of the different methods practiced and theories advanced in this work, both from a practical standpoint in a large clinic and a theoretical one in the physical laboratory, the writer wishes to discuss some of the factors that he regards as of much importance in the construction of the cast inlay.

TAGGART AND HIS IMITATORS.

From the introduction of the cast inlay to the present time there have been many who believe that Taggart had mastered the technique of making gold in-

lays when he presented the process that could not be detected from the foil filling when the two were in close proximity. Unfortunately it has been difficult to get all the methods employed by the designer of the process, and as a result some quite different procedures have been designated as Taggart's. Some have been designated as Taggart men because they use Taggart's machine. The writer has a close friend who uses a Taggart machine but as far as is known he uses no other of Taggart's products nor knows of Taggart's methods. Another is in mind who uses Taggart's products except the investment. The writer was recently designated as a Taggart man before one of the large societies of the country, by a man who is a profuse writer on the subject of casting, because he uses a comparatively cool mold when using the Taggart machine. The fact is, however, that I have for the use of my students, besides the Taggart machine, five centrifugal machines, one compressed-air machine, and one vacuum machine, advising as hot a mold as can be obtained without getting the shrinkage in the investments that occurs with temperatures upward of 1000°F. for use on the vacuum appliance; removal of the mold from the flame as soon as the investing material was dehydrated to the extent that vapor could not be seen rising from the mold and a piece of the same wax that was invested would rapidly disappear when placed upon the surface of the mold, and the cast made immediately, when it was to be done on the centrifugal appliance, and from this temperature to that of the room when using the Taggart machine.

TEST OF VARIOUS CASTING DEVICES.

These machines have been treated as devices for delivering pressure. The amount of pressure available and that actually delivered upon the gold has been taken into consideration when using any one of the types of machines mentioned. The condition of the mold relative to the delivery and maintenance of pressure has been considered. The rapidity with which the pressure could be delivered with the different types of machines, the nature of the casting to be made, the size, location, and number of sprues to be employed, the detail in some castings that can be sacrificed to the benefit of others, have each been studied simultaneously with the delivery of pressure by the machine and the influence of the temperature of the mold upon this pressure.

As a result of these observations we have found that we can produce more satisfactory reproductions of wax models in gold by the use of a technique that has been worked out for the production of the particular casting to be made and the machine to be used.

EXTREMES IN CASTING TECHNIQUE INJURIOUS.

In no instance has the writer advocated the cool mold for all kinds of work nor for all types of machines. In the Cosmos for September 1909 I advocated the cool mold in discussing cast inlays, but did not anticipate at the time of writing that article (February 1909) that there would be any necessity for working out a technique for use with pressure devices that have their efficiency modified by so many parts of the technique necessary to construct a cast inlay as do some of the present vacuum appliances now in the market.

Whether or not Dr. Taggart produced the beautiful results that Dr. Capon referred to by the use of the cool mold, the use of the artificial stone model referred to by Dr. Price, the hot mold referred to by Dr. Van Horn (Cosmos, 1910, page 878), the more recent suggestion of Dr. Price that warm water be used for investing the wax model, the taper walled cavities to be discussed later, or any other particular kind of technique, cannot be stated definitely at this time. The writer ventures the assertion, however, that not only Dr. Taggart but dozens of others can produce cast gold inlays that cannot be excelled at the present time, without the use of

the artificial stone models, the hot mold, or the warm water for investing the wax pattern.

It seems safe to assert that those who have produced the beautiful results that have been referred to have invariably been excellent technicians in other lines of work, and that they have pursued a practice more like that referred to by Ottolengui in Cosmos, January 1915, than to assume that they have been extremists and known in this work by the use of a cold mold or a hot mold, or any other form of extreme technique. Ottolengui says in the article referred to ("The Filling of Teeth with Cast Gold Inlays, and the Present State of the Art in the United States"):

> The true method of casting does not depend upon the utilization, but rather upon the avoidance, of extremes of temperature. The wax should not be chilled; the investment should not be made with cold water, and the mold should not be extremely hot when the cast is made. On the contrary, the effort should be made to work as close to room temperature as possible, the wax and investment thus being neither warmer nor colder than the surrounding air, while the mold itself should be as cool as possible, and consequently as little expanded as possible. Success, indeed, depends more upon a constancy and accuracy of technique than upon the utilization of any extraordinary means of overcoming faults which should not occur at all.

TECHNICAL SKILL A PREREQUISITE.

With the possible exception of Dr. Ottolengui's statement regarding the cool mold, his views relative to the production of good castings, and the assumption that men producing fine results have been fine technicians, seem to answer very largely the question asked by Dr. Capon. In the production of the cast inlay there seem to be several steps, any one of which may contribute to the success of the operation, but in all instances it takes a good technician to get good results. Those who are unfortunate enough to be unable to secure a beautiful wax pattern with well-defined edges need not expect that the casting will be any better. And those who have not mastered the handling of chisels need not expect to be able to get good wax patterns. Whichever of the two types of cavities that will be discussed later the operator chooses to adopt, he must possess and learn to use at least the following instruments from Black's set, viz, Nos. 49–54, 77–85, 99, 100, or must have their equivalent in someone else's set. From personal experience the writer has observed that not a large enough number of the profession have ever followed the teachings of Black and others about outlining cavities to enable them to carve a wax pattern to a definite outline or to finish the margins of a cast gold inlay after it has been inserted into the cavity. Neither has the mechanical work on cavities for inlays been of a sufficiently high order. But the outline of the cavity and the degree of mechanical skill exercised in finishing seem to be factors of first importance. There has been a tendency on the part of many who formerly practiced the laying down of cavity margins on areas that would be cleansed by excursions of the food in chewing to do less extension at the cervical margins, for two reasons: First, because it enabled them in most cases to prepare cavities for the inlay that had inclining walls without excessive extension of the occlusal surfaces of the teeth; and second, because the present demand for better oral hygiene seems to warrant it. There are some, however, who advocate almost if not quite as much cervical extension for the inlay as for the foil and other fillings; which means, according to their teachings, that the cervical portion of approximal cavities in highly susceptible cases is wider than the occlusal portion.

THE PROBLEM OF CAVITY PREPARATION.

While the writer has been, and is now, a firm advocate of extension into areas of relative immunity, the practice of trying to get an accurate wax model in all the cases that are found in a large clinic, where the duration of the operation and comparative weakness of the

finished operation seem to exclude the possibility of inserting a gold foil filling, when there were walls parallel to the long axis of the tooth, or as some advocate, a cavity wider cervically than occlusally, has resulted in such comparatively poor results that it has been abandoned.

The question may well be asked, Why not make the same extension for the inlay as for the foil filling. If accurate wax models could be made equally well in both cases, and if the contraction of gold in castings so shaped was equally well cared for, there would seem to be no reason for the distinction between cervical extension for inlays and cervical extension for foil and other fillings. While some claim that there is little or no necessity for the distinction, it appears that they are in the minority, and are in reality trying to adapt the inlay to the cavity preparation previously used for foil and other fillings. A recent statement by one who has been one of the closest students of Dr. Black's teachings seems to indicate a tendency to take a more rational view of what has appeared to many of the profession's finest cast gold inlay workers as an extreme view of the question of cervical bucco-lingual extension of approximal cavities. The statement referred to was: "I have about decided that when the case seems to demand wide bucco-lingual extension of the proximal cavities cervically, I will accomplish this with something else than the inlay." This assertion admits the inability of this well-known operator to make satisfactory cast gold inlays in cavities of the nature of those mentioned (see Fig. 1) and appears to bring out the limitations of the inlay in this respect. It is doubtful, however, if those of the profession who are most sincere in their advocacy of better hygiene for their patients are always allowing the question of whether an inlay or foil filling shall be inserted to be decided by the amount of cervical extension in a bucco-lingual direction that seems to be advisable. On the other hand, it would seem that better hygiene was being substituted in many of these cases for the former practice of wide cervical extensions; and likewise, the cast gold inlay is taking the place of the foil filling in many of these cases.

DIFFICULTIES IN COMPOUND INLAYS AND CAST BASES FOR CROWNS.

Since the writer has been unable to secure uniformly accurate wax models, or to get some of the most skilled students to do it, from cavities similar to the one shown in Fig. 1, and since the contraction of the gold in cooling in compound fillings interferes to a greater extent with the walls of the cavity nearly parallel than it does when the walls are somewhat more tapered, he has made a study of how much taper could be employed without losing necessary retention form. Obviously, in cavities of the shape shown in Fig. 2, where only inside dimensions are to be considered, as little taper as will permit the drawing of an accurate wax model will be all that is necessary—for the shrinkage of the gold in cooling will facilitate the insertion of such a filling. In Fig. 3 much the same is true, though we have here, besides the internal dimensions of the cavity, two external ones. In Fig. 4 we have the internal dimensions of the cavity and three outside ones. In Fig 5 the gold ring on the mandrel represents a casting entirely encircling the object from which a wax ring was made. It may be seen that the ring does not go down on this mandrel, with a taper of 1/100 inch per inch, nearer than about 437/1000 inch to the place from which the wax ring was removed. Obviously the trouble encountered from the contraction of the gold will be in proportion to the number of outside surfaces to be fitted. In cavities in the occlusal surfaces of the bicuspids and molars there should be little if any trouble in getting a cast gold inlay to place. In proximo-occlusal cavities in the same teeth there should be but little trouble. In compound proximal cavities, however, and in casting copings, etc., for roots of teeth, where the casting nearly or quite surrounds the object

from which the wax pattern was made, a more difficult problem is presented.

Fig. 1.

Fig. 2.

From the beginning the compound inlay and the cast base crown have been the most difficult to construct. At least three of the profession's well-known men have furnished evidence of this, one with a clinic on how to correct the cervical deficiency in gold inlays, another with articles and illustrations and a clinic to show how to construct a cast base crown by first adapting to the root and crown

Fig. 3.

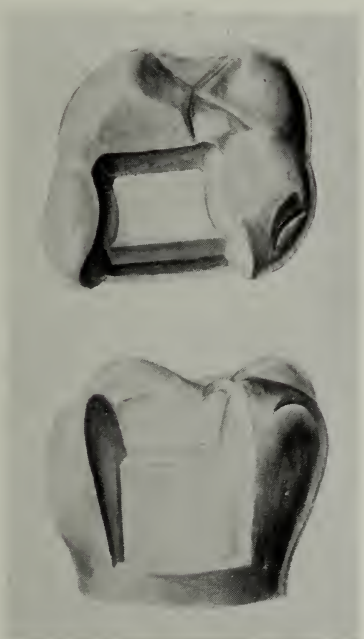
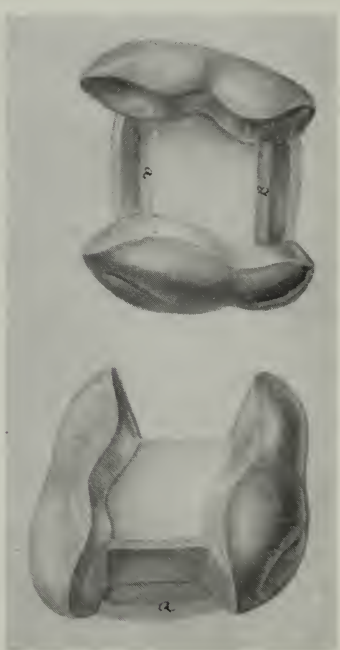


Fig. 4.



a plate of 24-k. gold. In other words, he is not attempting to adapt wax to the end of a root or a model of it and expecting a casting from this wax pattern to be satisfactory. Before the Lake Erie Dental Society in 1912 (*Dental Summary*, 1913, page 92), Goslee stated that "In the construction of gold crowns by the casting process, however, the fit or peripheral adaptation is, because of the spreading tendency of the wax, always best obtained by previously fitting some form of band to the root and then casting directly to it."

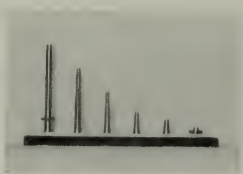
Before the Kentucky State Dental Society in 1913 (*Summary*, 1914, page 104), in discussing the cast base crown, he says: "In the various methods now generally used and advocated, good, accurate results are difficult to obtain, because the very plasticity of wax makes it possess a tendency to spread when subjected to the pressure necessary to mold it to a clean, close adaptation. This tendency has made it practically impossible for me to obtain a satisfactory degree of accuracy of adaptation to the root-end. However, such difficulty may be entirely overcome, and absolute accuracy obtained in all cases, by first adapting a cap of thin pure gold (about 36 gage) to the root-end." Later in the article he says: "Also, such a procedure reduces to a minimum the possibility of any change of form which may result from the warpage or shrinkage of the gold or alloy used in casting, and this is a very important consideration."

Approximately one year later (1914) at Detroit (paper yet to be printed in the *Dental Summary*), in discussing the subject of crown and bridge work he made essentially the same statements as he had previously made at Louisville in regard to the cast base crown.

Under date of January 14, 1915, I have from him a letter in which he says: "Replying to your question, will say that I have not changed my method of technique with regard to crown construction in any respect since my meeting with you in Detroit last year, and am still adapting the cap to the root by means of swaging pure gold or platinum on an amalgam die. An extended experience has convinced me that this is the only method by which I am able to obtain the degree of accuracy in the adaptation of my crowns to the root which I desire to obtain, and in addition to the accuracy obtained by previously swaging the thin cap, its very presence minimizes the warpage and shrinkage of the metal used for casting, hence making possible a better adaptation than might be obtained from the use of wax alone."

We have here repeated statements, covering a period of four years, from

FIG. 5.



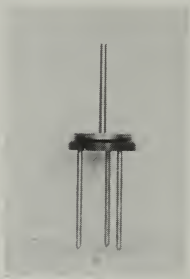
one whose identification with the subject of crown and bridge work is such that his opinion can hardly be counterbalanced with that of any other one man, that he can get a better result by not attempting to construct cast base crowns by adapting wax to either the root or a model of it without first adapting gold or platinum to it. It has been the experience of the writer both in private practice and in handling a large clinic that cast base crowns made by methods other than by adapting gold or platinum (preferably gold) to the end of the root or model have been so unsatisfactory that their construction has been abandoned except as a last resort in a few badly broken down cases. The question, then, of how some men got such beautiful results as were referred to by Dr. Capon without the use of the artificial stone model to prevent the gold from contracting, or the expanded wax pattern recently suggested by Dr. Price, may be answered by the statement that they do not make cast base crowns unless

they have a plate adapted to the end of the root—which method must be considered, first, as a factor in preventing the gold from contracting, and second, a method that insures the presence of the peripheral margin.

OBSERVATIONS ON DIFFERENCES IN ACCURACY OF FIT OF CAST HOODS AND COMPOUND INLAYS, AND THE REASONS THEREFOR.

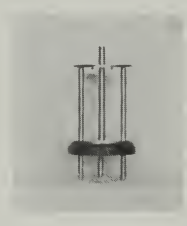
The compound inlay, with three outside surfaces to be fitted instead of four as with the cast base crown, has been done by some of the profession's best technicians by pursuing much the same methods as are suggested by Ottolengui, without the use of the plate that is suggested by Goslee for the cast base crown. The fact that such castings do not entirely encircle the object from which the wax was removed, and permit of a little stretching, must be remembered. Fig. 5 shows a set of hardened steel mandrels; the first and largest one has 1/100 inch taper in every inch, the second has 5/100 inch taper per inch, the third has 10/100 inch taper per inch, the fourth has 15/100 inch taper per inch, the fifth has 20/100 inch taper per inch, and the sixth has 25/100 inch taper per inch. Fig. 6 shows a hardened steel mandrel that is a duplicate of No. 1 in Fig. 5 to the 1/10,000 of an inch, together with a "raising device" (see Fig. 7) for raising a wax ring off the mandrel without distorting it. When a wax ring or washer is raised off the mandrel for this purpose and a gold casting is made from it, it will not go nearer than 437/1000 of an inch (see Fig. 5) to the place the wax came from, owing to the contraction of the gold in cooling. By passing this casting down the mandrels —all of which are of the same diameter at the base—successively tapered from 1/100 in. per inch to 25/100 in. per inch, it is seen that it goes to within 16/1000 of an inch on the 25/100 inch per inch taper (see Fig. 5). The writer has not been able to get a casting to go nearer to the bottom, even with a 25/100 inch per inch taper, than about 16/1000 of an inch. The difference between 437/1000 of an inch and 16/1000 of an inch approximately represents the effect of a 25/100 inch per inch

Fig. 6.



taper over a 1/100 inch per inch taper on a washer with a diameter of one-half inch and a one-fourth inch hole through it, with the technique that we are using. This amount is very plainly seen. The space between the base of the mandrel

Fig. 7.



with the 25/100 inch per inch taper and the gold washer which is approximately 16/1000 of an inch above it is also plainly seen. When compound inlays in molars and bicuspids are constructed with the same technique, however, they will pass to place so closely when made of 24-k. gold that no space is seen, providing the taper in the cavity is approximately 25/100 inch per inch, and especially at the points represented by *a* and *b*, Fig. 4. To eliminate the possibility of the elasticity of the tooth entering into the problem the same cavities have been prepared in steel and porcelain in large enough bulk to resist

any ordinary stress, and the result has been the same. The reasons for the washer not going to place, and the compound inlay going to place, appear to be, first, the shape of the inlay being such that it is stretched when but lightly pressed over a taper; second, the material is capable of being stretched with this amount of force; and third, the linear dimensions of such inlays are smaller than those of the mandrels, consequently less contraction takes place. That all three factors contribute to the placing of these compound inlays at various times, if not all the time, I think there is little doubt.

Cast gold can be stretched when pressed over a wedge with a force of four or five pounds when in the shape of a compound inlay in a thickness not exceeding 125/1000 of an inch. This is an easy experiment to carry out with ordinary measuring instruments. If, however, the compound inlay be made of gold alloyed with platinum or copper, or some other metals, the thickness that can be stretched is reduced in some instances to 31/1000 of an inch, and even less in others. It should be remembered in this connection that when once placed in the cavity the compound inlay is not subjected to the leverage of the wedge on the inlay some distance from the place being stretched, though there is a much larger force than four or five pounds placed upon the inlay in most of such cases. No such stretching of 24-k. gold in approximal or compound approximal inlays has been observed after the inlay has been placed, providing the cavity form had a good foundation and what would be called one of Black's occlusal extensions, except in a few anterior inlays that have been done in raising the bite for men where the conditions would seem to excuse the insertion of gold inlays in the anterior part of the mouth. This has led the writer to believe that those who are so enthusiastic about the use of alloyed golds for making inlays are using a cavity formation that would not be accepted by the students of Black's work or those practicing a somewhat tempered form of it.

Only when students or others doing the work have made the shallow and narrow occlusal formation, or have failed to get a good foundation for the inlay, have we observed the trouble so often described by some. On the other hand, we have observed the stretching of these inlays in a mesio-distal direction, and to take advantage of it in the finishing of the inlay we adhere closely to the beveled cervical margin (see Figs. 4 and 3) so that this thin part of the inlay may be burnished tightly against the tooth.

The third of the factors that appear

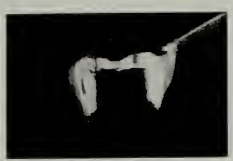
Fig. 8.

to contribute to the close seating of the compound inlay is the difference between the size of the mandrel and the size of the average inlay. The mandrel is 250/1000 of an inch in diameter at the base. In our clinic during the last six years, however, we have never found a compound inlay that exceeded 203/1000 of an inch, and only one that came near to this size. This may be because we are getting smaller teeth to operate on, or because we are selecting our cases more carefully than others, but it does not appear to be either. If the cavity shown in the last *Bulletin* of the National Dental Association, in the article by Dr. Price on page 118 (see Fig. 8) and which he says "reproduced as nearly as possible the actual condition obtaining in the molar tooth one-fourth inch in diameter with an MOD cavity, all walls of which had a taper of one per cent. to a common perpendicular," and if the inlay shown in

Fig. 9, which is a photograph of an inlay recently made at a casting contest where the cavity was supplied by the committee in charge, and if dozens of other similar cases that can be presented can be taken as an indication of what hundreds of the profession are doing in their cavity preparation for the inlay, there is good cause for believing that the reason why we do not get cavities that are one-fourth inch across the step portion is that we are cutting thicker seatings for them.

Whatever be the verdict of the profession relative to the cutting of good deep seatings for the cast inlay, the opinion of the writer will remain that cavities for the compound inlay that are

Fig. 9.



one-fourth inch across the step portion have a poor seating. It seems, therefore, that the contraction of gold as shown by Dr. Price in the cavity that he says represents the conditions that obtain in the molar cavities, and the amount shown by the mandrels that are one-fourth inch in diameter (see Fig. 5) is greater than the amount that will take place in the largest compound inlays for molars if they are prepared with the extensions and seatings recommended in Figs. 2, 3, and 4.

The compound inlay, then, that has a short portion of metal between the proximal portions has less linear contraction when the gold cools down than the one that is two or three times as long, consequently such an inlay will not show the amount of spreading that was referred to by Dr. Price in his paper read before this society in 1908, and which seems to be accounted for by the shape of his and the other cavity previously referred to.

The cavity shown by Dr. Price and the one that was prepared for the casting contest referred to, both show a taper of about 1/100 inch per inch, an amount not visible when the tooth is in the hand except under the most favorable conditions of light and when the tooth is revolved into certain positions. Under the conditions that exist in the mouth it seems impossible for anyone to be sure that there is a taper at all when there is as little as 1/100 inch per inch. If this amount would let one of the compound inlays down as far as the 25/100 inch per inch taper, would it not seem strange that anyone would adopt an amount that he could be sure of under all conditions for the sake of the removal of the wax? The question might be asked, Why are such cavities as shown in Figs. 8 and 9, with little or no taper and practically no seating form, presented as representing actual conditions in the molar teeth? In the case of the one from the committee shown in Fig. 9, I think that it is quite indicative of the general condition that prevails in the profession relative to extensions, seatings, and tapers for the inlay. In the case of the test cavity shown by Dr. Price, I would be inclined to think that he had prepared the most difficult cavity that could be prepared, coming anywhere near to the conditions in the mouth, for the sake of bringing out different methods of technique, were it not for the fact that he suggests that the wax from such cavity be expanded so that the inlay will go to place.

While it is difficult to say exactly why these types of cavities are presented, there appears to be no question about their being presented by a great many because they have never been impressed sufficiently with the matter of extensions and seatings. The question of tapers is one that does not date far from that of the origin of the general use of the inlay method of filling teeth, and it is not to be supposed that everyone has had this feature of cavity preparation for the inlay brought to his attention as it may be with a set of man-

drels with varying tapers. When the writer first began the work with the cast inlay he was under the impression that it was necessary that the cavity have as nearly as possible parallel walls to get the greatest possible retention, leaving little for the cement to do except to prevent the inlay from being drawn up out of the cavity. It had not occurred at that time that the inlay would go down farther on a taper of 25/100 inch per inch than it would on the 1/100, or the least amount that could be seen definitely. Later, however, when he came in contact with one in the same practice who was following the practice of prophylaxis and the treatment of pyorrhea it became necessary that an improvement be made in the condition of the proximal inlays at the cervical margin.

SUGGESTIONS IN REGARD TO CAVITY SHAPING.

This led to a painstaking study, in which it was found that the proximo-occlusal inlays were better in this respect than the compound proximo-occlusal ones. This led to the study of why this was true, and it was found that it was because the compound inlay was spread out, in the manner suggested by Dr. Price in his paper before this society in 1908, at the cervical portion. Immediately a study of the effect of tapers was made, and it was found that from 10/100 inch per inch to 25/100 would allow the inlay to go to place better than the very small amounts that had been used. The question of how much loss of retention there would be with tapers of this amount was then undertaken, with careful records, and it was found that, if the cavity were one that had a normal height from cervical to occlusal, and if a good seating was made and the occlusal portion was made of such width and thickness as would be accepted by an authority on cavity preparation for other materials, tapers of 25/100 inch per inch could be used without trouble from inlays being dislodged. The linear distance of the cavity from cervical to occlusal, the seating, and the size of the occlusal, all appear to have a bearing on the dislodgment of the inlay to as great if not greater extent than the amount of taper up to 25/100 or 30/100 inch per inch.

Since taking up the work in a large clinic these observations have been verified with records that show that not quite ½ of one per cent. of the several thousand inlays inserted have become dislodged when placed in such cavities as shown in Figs. 2, 3, and 4 with tapers of 25/100 to 30/100 per cent. per inch. The adoption of the tapers suggested, however, did not complete the study of how to improve the cervical portion of the compound inlays. The question of how to finish this part of the inlay soon resulted in using a larger bevel at the cervical, so that the inlay could be burnished close to the cervical to make up for the slight amount of spreading that was noticed with even as much as 25/100 inch per inch taper. This bevel may be seen in the cavities shown in Figs. 3 and 4. The burnishing of this part of the inlay to the tooth and the subsequent finishing soon led to the conclusion that 24-k. gold was preferable for these inlays, because it had proved strong enough when in sufficient bulk, and was much easier and better finished in these comparatively inaccessible places.

This experience with a specialist in the treatment of pyorrhea and practice of oral prophylaxis, together with several years' contact in a large clinic with those in charge of the gold foil fillings, who have demanded that inlays to be good for several years must look so near like gold fillings that they cannot be told apart, has caused a close adherence to the shape of the cavity shown in Fig. 4 when inserting the compound inlay, and the use of 24-k. gold. The factors of importance are, a taper of all walls of from 10/100 inch per inch to 25/100 inch per inch, depending upon the linear distance from one proximal portion of the cavity to the other, and a good bevel at the cervical, as shown in Figs. 3 and 4.

THE QUESTION OF BEVELS.

A form of cavity which has been widely demonstrated and written about is shown in Fig. 1. It differs from those shown in Figs. 3 and 4 by having a beveled margin all around the cavity, and it has almost parallel walls. Such cavities have been advocated, and are shown in *Items of Interest* for 1911, in the writings of one of the profession's good gold workers, Dr. J. V. Conzett.

More about the question of parallel walls seems unnecessary. The beveled margin all around the cavity is a subject about which more may be said, however. Dr. Conzett and those following this form of cavity preparation for the inlay seem to claim a better protection to the enamel rods as a result of this bevel. Some of those who have previously taken the same view of the matter have more recently stated that they were able to give the same protection with the cavity formation shown in Figs. 2, 3, and 4, the difference in protection being a question of whether there was the same occlusal extension in both cases. In studying a large number of cases it may be found that this view of the matter is approximately correct, though in some it may be necessary to make the taper to the step portion of the cavity more than 25/100 inch per inch to get the same protection shown in the cavity with the margin beveled all around. The objection to this form of cavity in the writer's hands has been inability in most cases to get the inlay down into the cavity as far as could be done with the form shown in Figs. 3 and 4. Upon examination it has been found that when the casting is made of 24-k. gold, the greater part of it that covers the bevel may be bent with comparative ease, but the junction of the bevel with the main portion of the step is the first to hold the casting from going to place. Inability to produce such angles with investing materials as soft as are now available has caused the abandonment of the bevel in this portion of the cavity, the beveling or rounding of such angles as are shown at *a*, Fig. 1, and the removal of some from the casting at *a*, Figs. 3 and 4, when it appears that a thin edge of investing material was present at this place when the gold was forced into the mold.

BEHAVIOR OF DIFFERENT WAXES USED FOR PATTERNS.

As upon the question of temperature of the mold when the cast is made, much has been written on the behavior of the different waxes used for patterns. Almost simultaneously came reports of experiments by C. S. Van Horn and Weston A. Price in 1910. In discussing the subject of casting, Van Horn says (Cosmos, 1910, page 877):

> It was proved that a pattern (wax cylinder) at the temperature of the water with which the investment was ordinarily mixed (say 54°–56°F.), the temperature of the water used in conducting the first experiments for this paper was some 0.0014 in. *shorter* than was the pattern at body temperature. Now, "It's a poor rule that won't work both ways"—therefore, to neutralize the shrinkage of gold, *expand the wax pattern* by having the investing material and the flask at a temperature sufficiently above the normal body temperature when the pattern is invested, to compensate for the shrinkage of the gold, which is in excess of the expansion of the investment.

Later in the same article he advises using water at the temperature of 115°–120°F. for mixing the investing material. It may be noted that the quotation implies that when wax is removed from the cavity to the investing material there is a reduction in temperature of over 40°F., and a reduction of the wax pattern as a result. To overcome this and to counteract the contraction of the gold he advises the expansion of the wax pattern with water for mixing the investment at 115°–120°. This would seem to be a good basis for the statement of Ottolengui previously quoted, that the "true method of casting does not depend upon the utilization, but rather the avoidance, of extremes of temperature," etc. In Cosmos for 1911, page 266, Dr. Price says of the "factors of error in the Taggart direct method":

"The wax for its pattern is put in the cavity at its workable temperature, which will be for the various inlay waxes from 95°F. to 130°F. It is cooled in the cavity, to render it firm and strong, to about 67°F. and in so doing it contracts, according to its formula, one or two per cent. of its linear dimension. If invested at this temperature an error of this definite amount is already carried forward, to appear in the final inlay, unless it be corrected by some other step." This implies that when a wax is cooled in the cavity it shrinks, and that the shrinkage is not corrected at the margins by the carving of the wax. Again the comment of Ottolengui seems appropriate, for the wax pattern is not smaller at

Fig. 10.

the margins when carved with a warm spatula by a clever technician.

Continuing, in the same article, Dr. Price says:

If the wax of the pattern, when being formed and cooled, surrounds the tooth structure, covering outside dimensions, it will be stretched as it cools, and it would by so stretching apparently correct part or all of the error of contraction from cooling; but all waxes have elasticity, and hence do not remain stretched, which introduces a new uncertainty or error to change the accumulated error. When the wax pattern is invested, its temperature will partly determine its dimension, for on heating from 67°F. to 100°F. or 130°F. the wax will be expanded, and if not carried to the softening point at which surface tension will distort it, or where the investment will change its shape, part or all of the accumulated error due to contraction of the wax may be corrected, and with a certain definite technique, to be explained later, even an error of expansion produced. The ordinary technique will not show the true expansion. Heating the pattern to enlarge it will release its elasticity and allow much distortion.

In the next step, that of heating the investment material, if it be of the best quality we may have an expansion of about one per

Fig. 11.

cent., or if of poor quality we may have a contraction of two per cent., according to our manipulation, and if the investing compound is soft and yielding it can be distorted easily by the pressure of the gold when casting, thus causing an error which is not a uniform expansion.

When the molten gold is forced into the investment, its physical state changes from liquid to solid, and here we have what has heretofore been an entirely unknown factor, but which we will show later to be a very large contraction; and again, on changing temperature from its freezing-point and cooling to normal temperature, it contracts, as

Fig. 12.

the writer has previously shown, over two per cent. (*Items of Interest*, May 1908.) This contraction can be partially controlled by pressure on the congealing gold, thus forcing gold from the sprue, and partially by holding the gold as it contracts, *i.e.* by causing it to surround a strong form, thus preventing the normal contraction.

The relation of the size of this final casting of gold to the original cavity in which

the wax pattern was made may thus vary through a wide range, and the final error is the sum of all the plus and minus changes made in the size of the record of the cavity as it passed through the different materials and processes. We will show definitely the amount of change produced by each step.

To work intelligently we must therefore know the behavior of the materials used for each step, and make the unfixed or variable changes correct the fixed changes.

CRITIQUE OF DR. PRICE'S CRITICISMS OF TAGGART'S DIRECT METHOD.

It may be noted that Dr. Price is discussing "factors of error in the Taggart direct method." First, he points out that wax shrinks when placed into the cavity, but does not point out that the shrinkage is corrected at the margins by the carving. Second, he points out the elasticity of the wax, and implies that a wax which has been stretched again returns to its original form during the construction of the inlay, apparently not recognizing the fact that some of the profession's best technicians are using the water from the same glass to both chill the wax while carving it to carry the wax in from the cavity to the bench for investing immediately and to mix the investing material with, thereby not getting a change in temperature of more than a degree or two before the investing material has hardened. Third, he mentions that investing materials properly made will expand approximately one per cent., but, if of a poor quality, will shrink about two per cent. It may be pointed out that the good ones will also contract rapidly if heated very long at a temperature of 850°F. or higher, hence the reason why Taggart has advocated from the beginning that the mold be removed from the heat as soon as the wax had been melted out of the way for the casting and had a sufficient dehydration to prevent much back pressure in the mold when the hot gold was forced into it. Fourth, he mentions that some investing compounds are distorted when the gold is forced into them, and says that this gives an error that is not uniform expansion. From the beginning Taggart has advocated a nicely regulated low pressure delivered quickly, a feature in which no other appliance to date can excel his. Fifth, he mentions that gold contracts on cooling, and suggests that it may be partially controlled by pressure on the gold during cooling and by using a strong form, such as artificial stone, to cast the gold around.

That such errors as the ones mentioned might occur in the hands of a bungling technician there is little doubt, but to call them "factors of error in the Taggart method," and to suggest that it was necessary to use such radical technique as the artificial stone model, high pressure on the gold while cooling, and an expanded wax to correct the errors seems to show unfamiliarity with Taggart's methods. Later in the same article, and in various parts of the current literature, reference is made to the change in volume of waxes which has been so thoroughly investigated by Dr. Price and presented by him at various times both orally and through the dental journals. The elasticity of wax has likewise been studied and reported in detail by him. A careful review of the articles referred to by Grieves in his report before the Sixth International Dental Congress in *Items of Interest* for October 1914, which includes many of the best ones, will show that many of the profession have encountered much of the trouble that is referred to by Dr. Price, but the writer is of the opinion that there must be some who have never encountered these troubles, because their results cannot be excelled, and they are not using the methods suggested by Drs. Price, Van Horn, Lane, and others relative to the use of hot molds or expanded waxes.

It seems safe to assert that no one can fail to acknowledge the debt of gratitude that is due those who present such detailed scientific data as have been presented by some of those mentioned relative to the behavior of waxes, but it appears to the writer a mistake that the conclusions to be drawn from such research should have been made and advocated to busy practitioners of

dentistry as the corrections for errors which had already been demonstrated to be entirely avoidable.

Therefore it seems unnecessary to consider the change in volume or the elasticity of the wax, if it be invested immediately and be transferred without change of temperature, unless the pattern is to be purposely expanded. The aim should be to avoid a change in temperature that would change the volume of the wax or release the tension placed on it when packing it. This seems to be the most valuable practical lesson to be drawn from the work of Dr. Price on waxes, viz, *invest the wax immediately,* not allowing it to change temperature from the carving to the investing. By obtaining a glass of water at room temperature and using this to cool and invest in as well as chill the wax with, using a good-sized pellet of cotton for the purpose of chilling the wax, the process of carving and investing and carrying the pattern to the laboratory may be carried on without involving a perceptible change of temperature. The expanding of the wax for the purpose of enlarging the casting appears to be an unsafe procedure except when the wax is of a uniform thickness—as in a few saddles for bridge work, etc. In the writer's hands it appears more satisfactory as a laboratory procedure than when used in the mouth. Any amount of releasing of the tension on the wax in the mouth that can be accomplished has not allowed the expansion of it afterward to give a casting true to form.

In the production of the gold washer for the mandrel the expansion of the wax aids materially, but the patterns do not remain true to form when taken from some of the irregular cases that are found in a large clinic. These irregular expansions appear to be due to uneven elasticity, density, and thickness of the wax after packing into the cavity. Whatever be the cause, it does not appear so contributive to beautiful results, in the great variety of cases found in a large clinic, as does the close adherence to the technique previously mentioned.

TEMPERATURE OF THE MOLD AT THE TIME OF CASTING, DETERMINED BY THE CASTING MACHINE USED.

Another subject which has been discussed by several writers is that of the temperature of the mold at the time of casting. An extended inquiry into the methods of a great many who have been known to be reasonably successful with this work has revealed that by far the greater number have favored what would generally be called a hot mold. This has been especially true with those who are using the vacuum principle for delivering the pressure. With one or two exceptions, the opposite has been true with those who were skilful with the Taggart appliance. The difference between the various machines on the market for the purpose of delivering pressure and the Taggart type of machine is very apparent in at least two respects, viz, the Taggart machine has the most uniform pressure of any device that has been presented, and it also permits of the quickest delivery of the pressure, of any device yet offered to the profession. These two features, and especially the latter, permit of using a cold mold without having the gold solidify before it has reached the remote parts of the mold, which are usually acute angles made by the margins of the wax. With a device like most of the vacuum appliances the application of the pressure to the molten gold is not to be compared in quickness of delivery, the Taggart appliance doing this with a spat that is so quick that it is hardly visible. With a recently designed centrifugal appliance (see Fig. 10, p. 524) that has a straight arm with a shield to direct the gold toward the mold, the pressure is delivered somewhat as with the Taggart appliance, though not quite as quickly or uniformly. This device is sold by the Patterson-O'Brien Co. of St. Paul, Minnesota, and is capable of doing very good work if the principles involved in the delivery of pressure by the centrifugal method are taken into consideration. It is obvious that with a vacuum appli-

ance a cold mold will not do for many irregular castings with thin sharp margins, for the gold will never reach such places in the mold. With the gold lying directly over the sprue, as it does in the Taggart appliance, and with the pressure applied with a spat, the gold, in the case of nearly all kinds of shapes of castings for inlays, can be carried to the finest edges in a mold that is at the freezing-point of water.

The possibilities of the two machines in this respect are as different as can be imagined. The centrifugal appliance referred to occupies a middle ground in this respect. The centrifugal appliances that have an arm with a joint that moves outward under varying conditions are not to be compared with the one referred to, either, in this respect. It seems, therefore, that from the standpoint of the delivery of the pressure, the cold mold is permissible only with the Taggart type of appliance and with the centrifugal appliance referred to, or one of the same type. Since more dehydration of the investing material aids in the passage of atmospheric air to the vacuum, the hot mold would seem to be capable of aiding in the delivery of the pressure with the vacuum appliance. It seems clear why those using the vacuum appliance should use the hot mold, though it does not account for the use of the cold mold by those using other types of machines.

In 1908 the writer advocated a cool mold for casting, and pointed out in this connection that gold and other metals do not have the fixed contractions on cooling that were attributed to them, save under fixed conditions. Excess of heat, shape of casting, combination with other materials, and a cool mold were pointed out as modifiers of the amount of contraction that would take place when the casting cooled down. Since that time several men have referred to the statement that a cool mold would produce a larger casting, and each seems to have placed some different interpretation on the word "larger." Apparently none of those who have discussed the subject have tried the casting of gold into a cool or cold mold with an appliance that would carry the gold to the finest angles, and have taken as the basis of their conclusion the contraction that occurred in compound cavities, cast base crowns, etc., where the casting has three or four outside dimensions to fit. There should be no trouble in observing that the distance from one cervical margin to another on a compound inlay is greater with the cool mold than with a hot one, with the Taggart appliance and the pressure regulator set below 6 lb. The best form to illustrate the difference seems to be a discoid with knife-blade shape (see Figs. 11 and 12, p. 524). In this casting, as with most large inlays, much of the shrinkage of the gold in a cold mold is represented by a hole in the casting in the locality of the sprue, or a sprue reduced in size or even disconnected from the casting when the Taggart type of appliance is used with low pressure and a sprue-hole that is small enough to prevent a premature falling of the gold into the mold by any little jar that may be given the appliance at the time of casting. These sizes of the sprue-hole vary from 20/1000 to 40/1000 of an inch. With a larger sprue-hole and increased pressure and with smaller castings the metal is fed fast enough to prevent the formation of the hole in the casting, and the shrinkage appears to be more uniformly distributed throughout the casting. A pressure, however, that will make sure the feeding of a casting of the size of a large compound inlay in a molar with a cold mold will invariably distort the mold, the very thing that we aim to prevent. If, on the other hand, the pressure is maintained and the sprue-hole increased in size for the sake of feeding the cooling casting, the back pressure in the mold produced by the incoming hot gold causes the gold to return against the pressure of the machine. With the centrifugal principle (as in Fig. 10, p. 524) the sprue-hole may be as large as 80/1000 of an inch and the pressure increased according to the following formula $\left(\frac{Wv^2}{32.16R}\right)$, many times that mentioned for the Taggart

appliance, and as a result the gold is held to the remote parts of the mold in most cases against the back pressure, and the casting is fed with molten gold as it contracts. Such castings, however, as are made with the fine silica and plaster-of-Paris investing materials that are now in the market will be untrue to form so often that the method, while it is in keeping with modern practice in allied casting work, must not be compared in accuracy of fit in the casting with castings made under low pressure.

Castings distorted from high pressures that are necessary to feed the molten gold during the cooling may sometimes be fitted to make a very acceptable result, but they must have the fitting. It must be remembered, however, that the feeding of a cooling casting requires heat, pressure, and a sprue-hole that does not cool at the same time that the remote part of the casting does, and by so doing shut off the feeding. The latter is what takes place with the use of the small sprue-former and the low pressures usually used on the Taggart appliance, the result being that the casting is not always fed, and the shrinkage is often represented by a hole in the casting, a sprue that is reduced in size, or one even disconnected from the casting, because the gold is kept a little hotter at this point owing to the heat applied to the investing material in melting the gold, but is not in a condition to be fed to the casting below.

TWO KINDS OF CASTINGS.

Two kinds of castings appear as a result of the use respectively of low pressures and small sprue-formers, and high pressures and large sprue-formers. The former may be known as those that are not always fed with molten metal, depending upon the size, shape, etc., of the filling, and the latter may be known as those that *are* fed with molten metal. With the former, fine margins which often determine linear dimensions are often dependent upon a cold mold that will chill the metal instantly at the margins, thereby bringing into operation surface tension which pulls the cooling metal from the center toward the congealed margins before an appreciable amount of back pressure has had time to form from the hot gold. With the latter, fine margins may be produced with either a hot or a cold mold, though in the writer's hands there is little comparison, in accuracy of fit, between the casting made under low pressure and the one made under high pressure, in any investing material now available. For this reason the low pressures and cool mold have been adhered to with all our machines, which would deliver the gold to remote parts of the mold into the finest margins before congealing, even though there was a hole in the casting—a defect easily corrected with a small piece of lower-karat gold and a blowpipe.

A close study of the "Hadfield process" of making sound steel ingots, by Sir Robert Hadfield, in the Proceedings of the Iron and Steel Institute, and the numerous references to the process by others, the practical suggestions by John Sharp and others, as well as a careful survey of the operations of the foundries where perfect castings are a necessity, will, in the opinion of the writer, convince the present users of hot molds that the problem with a foundryman in most cases is, first, a cool mold, and second, facilities that will feed the molten metal to the casting as it tends to form the hole in the center. Since the present investing materials do not seem to resist the pressure necessary to fill all shapes of castings without distortion of the mold, it appears that the better practice is to adhere to the cool mold for the cast inlay where the fine margins and true form are the important features, and get a pressure appliance that will deliver the pressure quickly and uniformly, allowing the hole to form in some of the castings rather than attempting to feed it.

With castings other than inlays, where the fine margin is not so important a feature, a warmer mold may be permissible, but in no instance does it seem that the quality of the casting nor

the trueness to the form of pattern is improved as a result of the increased heat. Until dentists adopt the use of pressure appliances that are capable of filling a cool or cold mold for a compound molar inlay, to the finest angles, quickly and with uniform low pressure, they will not realize to the fullest extent what a perfect reproduction of a wax pattern is.

INVESTING MATERIALS.

There are on the market a few investing materials that will not permit, in the writer's hands, of the use of the cool or cold mold with any pressure appliance yet devised. Upon examination it has been found that the difficulty lies in the lack of porosity of these products. No amount of pressure obtainable with any of the devices tried would result in the fine margins that could be obtained with other materials. Not only have these materials been the cause of failure in our hands when used comparatively cold, but also when heated thoroughly. This lack of porosity of these products seems to cause the air to become compressed as the gold rushes into the mold, and to prevent the escape of the gas formed from the hot gold.

The introduction of such materials as clay, magnesia, whiting, and others that will become denser with heat appears to furnish contributing if not controlling factors in the cause of the density of these materials. An investing material must allow air and gases formed from the hot gold to pass out readily, if the gold is to reach and to be held in the finest margins. While clay and magnesia both add to the strength of most of these investing materials, as their setting qualities are added to those of plaster, they both shrink under comparatively low heat and make an investing material that is very dense and hard as compared to one made from plaster alone as the binding material.

The writer pointed out in 1908 that the only material then available that could be depended upon to expand regularly upon the application of heat, and thereby counteract to a great extent the shrinkage of the plaster, was silica. It was also pointed out that two or three grades of sizes of silica would eliminate much of the tendency of these materials to crack, because there would be an overlapping of the different sized particles. From that time until now there has been little improvement in the material suggested at that time for inlay work, either by the manufacturers or anyone else. There has been a tendency by the manufacturers to adopt the use of a coarse grade of silica that had round particles instead of the No. 200 flint suggested. This appears as a little improvement over the angular flint suggested at that time.

Two or three grades of silica, with the finer grade predominating, together with plaster of Paris, in the proportions of approximately four of silica and one of plaster, as adopted by the majority of the manufacturers, will permit the use of a cool mold and the pressure devices that are quickest in their delivery of the pressure. Those containing the materials suggested that set or bake hard, however, seem to have no advantage except strength, which seems to be insufficient in importance to counterbalance the objection attaching to them of not being porous enough.

A CASE OF EXTENSIVE ALVEOLAR ABSCESS ASSOCIATED WITH PYEMIA.

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ALTHOUGH many cases of similar nature to the one to be described have probably been recorded, the case under consideration presents so many complex and interesting phases to all interested in oral surgery that it is probably worth noting.

HISTORY.

On March 29, 1913, the patient, Mrs. X., presented at my office for the first time with an inflamed and very painful area in the lower right third molar region. The patient, the mother of one child, was a frail, anemic subject of about thirty-two years of age, affected with palpitation of the heart and occasional fainting spells. She had extremely carious teeth, which had lost their fillings, and her right temporomaxillary articulation was very susceptible to dislocation, no doubt owing to the weakness of the ligaments of that joint.

The patient stated that about four weeks previous to her visit she had consulted a dentist for the extraction of a lower right third molar—which is important to note; but although she thought then that the operation was complete (as she was told), three weeks after, or one week before she presented to me, the region became painful and she described the condition as "a feeling of something still there."

DIAGNOSIS.

The patient's general history immediately caused me to look for one or more roots which might have been left in the alveolus and were already starting to cause an abscessed and necrotic condition. Upon digital examination nothing of that nature could be found, but upon probing in the partly opened and inflamed socket I could feel what seemed to be a root and some necrotic bone surrounding it. In order to make a positive diagnosis, I advised that a radiograph be taken; to this, however, the patient would not consent, saying that she knew something was there without seeing a picture of it. My work, therefore, had to be based upon that presumption, although I regretted the lack of a more positive diagnosis, and my object was to remove as soon as possible the abscessed remaining root.

TREATMENT.

In order to relieve the soreness, I first cleansed the socket with a 10 per cent. silver nitrate solution, followed by a deep application of tincture of iodin, over which I applied orthoform, an anesthetic powder, and told the patient to make up her mind that, since I could not secure an X-ray picture, I would have to treat the case slowly, as I did not care to damage the tissues further, not being able to determine the conditions exactly, especially since there was intense swelling.

For the next week the patient presented each day, and gradually I was able to remove small portions of necrotic bone, although the root was yet obscured and undisturbed. So far, no pus or external swelling was noted. My treatment was confined to a daily syringing of the cavity with a saturated

solution of boric acid and to advising the patient to use the same solution every two hours at home, my intention being to remove the root when the socket became cleaner, as I expected it to be in about ten days, as the pain and swelling subsided. About one week later, her pain being relieved, the patient failed to make any more visits, as unfortunately is often the case.

About one year later, on April 27, 1914, she again presented with a most enormously swollen right mandible and a serious condition of locked jaw, due chiefly to an involvement of the masseter muscle and an extensive osteomyelitis of the adjoining portion of the mandible. It was necessary to make a mouth-prop of modeling compound in order to keep her mouth open, so as to be able to work properly. Of course I could not help immediately recognizing the case as one of extreme osteomyelitis and extensive necrosis due to a slow spreading of the infection resulting from the abscessed root the removal of which had been neglected. This most discouraging condition was aggravated by the fact that the patient was pregnant and expected confinement within a month.

I now prescribed potassium iodid, according to the formula of Dr. Fortiner of New Jersey, for the purpose of relieving the locked-jaw condition. I next resolved to extract the abscessed root at any cost and also removed much loose necrosed bone, but I did not use any force to remove such bone, for reasons to be stated hereafter. It is here necessary to explain that my work had to be done from ten to eleven o'clock at night, because the patient was unable to come during the day, the family sleeping during that time in order to spend their waking hours with the husband, who was working at night.

Two days later, after a most trying local operation without any anesthetic whatsoever, I removed the abscessed root entirely, but not until much destruction had been done owing to neglect of treatment, with consequent later results. My treatment again turned to thorough washing-out with saturated boric acid; I also removed a large portion of necrosed bone, together with the appended sound second molar tooth.

Here, very abruptly, despite great swelling, considerable necrosis, and osteomyelitis, the patient failed again to appear.

On June 20th, seven weeks later, I received a message from the patient's physician asking me to call immediately for a discussion of the case, as she was in a most serious condition. Upon seeing him at her home, I learned the following facts about the case: On May 13th she had given birth to a healthy male child, having had her old family physician in attendance. Before and during the period of her confinement, from the time she had last seen me at my office, she had still been bearing all the conditions attendant upon her abscessed and necrosed jaw, for which she received no treatment. Her first physician being called away, a second physician was called in, who informed her that the abscess treatment could be temporarily disregarded. This discontinuation of treatment was the most unfortunate circumstance of all. Four weeks after her confinement she went out for exercise, meanwhile suffering intense facial pain, due to neglect of treatment. At that time pus was constantly forming as the necrosis increased, and as it formed, automatically increased the necrosis and osteomyelitis. In trying to escape, this pus pressed upon the tissues, causing the patient intense agony. Nevertheless she was told to disregard the condition, and no dentist was consulted. The patient suddenly developed various symptoms of pyemia, and her second physician recognized the gravity of her condition. The patient had failed to realize her becoming a victim of gradual intense autointoxication, due to the incessant ingestion into her system of ounces and ounces of pus containing staphylococci and streptococci which were gradually involving all the tissues and organs of her body. Her physician immediately resolved to cut into her diseased jaw-

bone in order to afford relief, and he lanced the inflamed area, three times, from within; the patient refused to allow him to work further, as he was unsuccessful in his attempt to liberate any pus. The next day, however, after this attempt, the external tissues were perforated by the pointing and escape of the pus itself; about a pint of pus was liberated, and the fistula had completely established itself from within outward, affording great relief locally to the patient. During the next two weeks the constitutional pyemic symptoms became aggravated, and the physician left the case to be attended to by her dentist. On the 19th of June she called in a third physician, who after examining her, sent for me the next day, as stated above.

At that time her condition was as follows: Pains all over her body, especially in the regions of the spleen, kidneys, genital organs, head and neck; intense, diffused, sluggish yellow hue; inability to move the limbs freely; intense thirst; little hunger; inability to swallow or move the jaw; enlarged cervical lymphatic glands; copious discharge of pus both within and without; fairly large swelling; extensive necrosis and contiguous osteomyelitis; temperature of from 103°–105°F.; respiration of about 14; pulse of about 130; periodically severe chills lasting an hour at a time and followed by severe perspiration, which latter symptoms are almost pathognomic of true general pyemia.

As a prognosis, after comparing notes, we decided that we did not think the patient could live another week, especially since she had no nurse or other help in attendance, and as she absolutely refused to go to any hospital, even her husband being unable to persuade her to do so.

We then decided to lay the stress of treatment, as a final hope, upon her jaw alone, although she also had a slight sapremia as a result of neglect during her confinement, which latter affection, however, passed away quickly upon antiseptic treatment. Therapeutic efforts were now concentrated upon her diseased jaw, the physician later prescribing euquinin as a general alterative and antipyretic in strong doses.

After a close examination of the patient's mouth and jaws, I first cleansed the mouth thoroughly with a strong listerine solution, removed as much pus as possible, and advised the use of a strong boric acid solution as a mouth-wash every hour, the former drug being too expensive for her to use. After removing as much pus as possible by palpation toward the cloaca, I injected into the fistula by way of the alveolus five or six drams of boric acid with a hypodermic syringe, and cleansed the fistula by letting the solution find its way out externally.

I absolutely refused to curet any bone —in spite of what the text-books advise in these cases—for the following reasons. First, and most important: The intensely weakened condition rendered it likely that the infection would easily be pushed out beyond the area already involved instead of confining it, by forcing more pus and infected matter into the surrounding tissues, which were now very susceptible to infection. Secondly: There was no visible sequestrum or line of demarcation. Thirdly: The escape of pus and proper antiseptic and prophylactic treatment were sufficient measures, under the circumstances, and served to check further destruction of tissues. Fourth: In order to curet, a general anesthetic would have been necessary, but the patient was too weak for that, especially since her heart action was very poor, as indicated by a pulse of 130.

This simple treatment was followed by inserting a moistened drain of half-inch gauze externally so as to allow an unobstructed exudation of pus; over this I applied a regular surgical dressing held in place by a plain bandage over the head, as any other form of bandage, such as the Barton, was too cumbersome. This procedure was repeated twice a day for eight days, always evacuating by massage as much pus as possible and using a syringe to cleanse the fistula.

Five days after starting this simple antiseptic treatment I noticed a reduction of temperature, cessation of chills, normal breathing, healthier pus, and an improvement in the patient's subjective feeling, the yellow pyemic hue having subsided, a more healthy color taking its place. One week later I reduced the treatments to one a day, and then succeeded in removing much loosened necrosed bone.

Meanwhile, the euquinin, which had served its purpose, began to produce symptoms of cinchonism, consisting in temporary loss of equilibrium, headache, dizziness, and buzzing in the ears, and we discontinued its use entirely. By the 10th of July I was able to see the patient in my office for a better examination. At this visit I removed much proud flesh, necrosed bone, and coagulated blood, the dead bone having a splintery, softened appearance, due to the process of liquefaction necrosis which always accompanies alveolar abscess. I cleansed the fistula with a 2 per cent. phenol solution, the treatment leaving the patient in a somewhat exhausted but greatly relieved condition. A dressing of rubber oil-silk over the cloaca, covered by gauze and adhesive plaster, was now used, so as to dispense with the more annoying bandage over the head.

CONCOMITANT METASTATIC ABSCESSES.

During the treatment described, my attention was called to two small metastatic abscesses in the post-scapular and acromial regions, which had presented because—First: Gravity had drained the pus downward along the lymphatics in these regions. Second: All of the pus, owing to its great quantity, could not escape at the fistulous opening, because of the thick superficial cervical fascia in this region, which prevents pus from drawing through facially, but causes it to ooze downward to the lower limits, posteriorly and anteriorly, of the thickened fascial wall, where the deep cervical fascia prevents it from penetrating inwardly.

These metastatic abscesses were soon disposed of by gently massaging the pus upward to its source and by external application of aconite and iodin, which promoted lymphatic absorption. Most of the pyemic symptoms were now rapidly disappearing and the patient was much more at ease, although the pus still flowed copiously. There also remained, at the end of September, some necrosed bone, which by cleansing and prophylactic treatment had to be taken care of, but was gradually exfoliating. Again the patient exhibited another peculiar determination, and decided that she would be "operated on" for removal of the little remaining trouble (which by simple treatment had now almost been entirely removed), because, she said, "she wanted to have the trouble over with at once." However, although she left me, after I had actually saved her life, she neglected the "serious operation" as she termed it. About a month later she reappeared with a piece of necrotic tissue about a quarter of an inch wide and half an inch long, which had been removed by an operation (?), although she herself admitted that the "operation" was not warranted and that the necrosed bone might have been out long before by nature's aid, had she allowed me to follow up the simple treatment. She again asked me to take up her case, which I told her I would gladly do, but there was nothing left to do, as she had only to continue her prophylactic measures and her jaw would be restored to normal, although it was much deformed, as she had lost practically the entire angle of the mandible through necrosis.

SUMMARY.

In reviewing this case, the chief points of interest, and the deductions therefrom, are:

First, and most important: Every operation for the extraction of a diseased tooth or the roots of a tooth must be complete, and if under any circumstances the operator is not absolutely positive of the completeness of the operation he should so inform the patient,

and complete the work as soon as possible.

Second: In any doubtful case, a radiograph is useful—in fact it is indispensable in the more difficult cases.

Third: Neglected roots, when allowed to remain and to give rise to alveolar abscess, will not alone cause local destruction of tissue, but may become the source of an incessant and most dangerous absorption of virulent bacteria and the accompanying products of putrefaction and decomposition—or, more plainly speaking, of the absorption by the blood and lymphatics, the primary fluids, of pus with its attendant myriads of pyogenic bacteria. These, with other morbid changes, in persons of reduced vitality, react in the most serious form of auto-intoxication known, viz, true general pyemia—as was shown in this particular instance.

Fourth: Such a condition, when present in a pregnant woman, not alone endangers her own life, but by way of the fetal circulation the life of the fetus, causing the child to be born already diseased or even dead.

Fifth: Only the most favorable turn of circumstances and careful systemic treatment, coupled with strict antiseptic and prophylactic local treatment, can save the life of a person thus affected, the usually fatal result of pyemia being well known and recorded in medical literature.

THE RESPONSIBILITY OF THE MEMBERS OF THE DENTAL PROFESSION TO THOSE WHO ARE WITHOUT OPPORTUNITY FOR DENTAL TREATMENT.

By B. HOLLY SMITH, M.D., D.D.S., Baltimore, Md.

(Read before the union meeting of the National Dental Association and the Georgia State Dental Society, June 5, 1914.)

EVER since the days of Cain, the question "Am I my brother's keeper?" has been asked, and has found an answer in organized and individual effort for the protection and uplift of mankind, in the betterment of his social, religious, and physical conditions. Philanthropists have built hospitals, almshouses, and churches; colleges and other institutions of learning have multiplied, that man may be trained in the art of living and serving his fellows. Lawyers and statesmen have drafted statutes which, when enacted into law, restrain and punish the vicious and wicked or give greater scope to the civil and religious liberty of the citizen. Scientists and physicians have made plans for sanitary living, for the prevention of the spreading of contagious diseases, and the purification of the food supply. Farmers all over the country are making an organized effort for good roads; merchants and commercial organizations have formed vast plans for the extension of commerce and the increase of manufactures. In fact, the world is teeming with one grand musical hum in affirmation—"I *am* my brother's keeper."

Accepting this acknowledgment, what are we, as a profession, to do with the statistics and statements of writers and students of the relation of neglected mouths to the economic status of those who possess them? When we are told by perfectly reliable authorities that the mental, moral, and physical efficiency of the child or adult is increased from 50 to 100 per cent. by substituting normal for abnormal mouths; when we read

once again Dr. Osler's so often quoted statement, "If I were asked which did more harm to the human family, decayed teeth or alcohol, I would unhesitatingly say, Decayed teeth;" when we are repeatedly told that less than 10 per cent. of all the people ever receive any dental attention; when in the examination of about one thousand mouths in a Baltimore public school less than three per cent. were found where dental attention was not immediately needed; when the most advanced and enlightened physicians insist at the beginning of the treatment of almost any serious disease that the mouth must be placed in a healthy condition; when the noted surgeon, Charles H. Mayo, says, "The next greatest step in medical progress in the line of preventive medicine should be made by the dentist; the question is, Will he do it?"—we must realize that we are facing a demand as imperative as it seems universal.

I have no doubt in my mind that we will say as individual practitioners, "We *do* do it," and I repel the implication of the great surgeon that we do not. Our private patients all over the country get intelligent and skilful service, and we are more than willing to hear argument from the physician in favor of what we have long contended, that neglected mouths invite disease. We hail with joy the co-operation of our brother medico, and thank God for his conversion even at this late day; but what has this to do with the other 90 per cent., those who have no dental attention and no chance to get it? Why, when the people of Georgia realized that strong drink was degrading her citizens and endangering the safety of her homes, men, women, and children all joined in one mighty effort to prevent its sale, until today, I am informed, you cannot get a drink outside of the Capitol City Club.

Now, if Dr. Osler's words are even partly true, we must feel a deep sense of responsibility that the people should realize the situation. We must involve our municipal and state officials, our preachers and teachers, our social workers, our philanthropists, and other public-spirited citizens. Each individual, as well as each association, must work toward the goal, unceasingly teaching, always pushing the line nearer. First, last, and all the time, however, must the dentist himself keep at the good work; he must be in the van. Only in this way will real advance be made, by our own sacrifice—sacrifice of ease, sacrifice of serenity, sacrifice of time and money.

In all the world's history the march of human progress has been measured by sacrifice. Idleness and self-indulgence caused our first parents to be turned out of the paradise of Eden to wander in barren places, they and their descendants reaping the consequences of their misdeeds in crime and tragedy. Self-sacrifice and devotion to the state built up the mighty Roman and Greek nations to be the most cultivated and enlightened people the world had known, while self-indulgence and love of ease caused their governments to decay, their people to degenerate, and their evidences of culture and refinement to crumble in the dust. The history of the establishment of growth of our own nation, the like of which the world has never before known, has been one long succession of sacrifices, from the suffering and starvation of the colony at Jamestown to the bleached bones that lined the trail out to and over the Rockies.

For every great industry developed, every discovery of science proclaimed, every invention that saves labor and facilitates manufacture, we can see in the background the student, the thinker, the mechanic, the scientist working with the energy of a steam-engine long after average men have gone to rest, proclaiming in the language of an Edison that four hours is all the sleep he ever gets, or of a Schwab that he could set up and run every intricate piece of machinery used in the manufacture of steel; or we might point to the inventor of the linotype, who laid down his life in the perfecting of this invention, which has revolutionized printing.

It is of such devotion as this that

American material prosperity is made, until American wheat, corn, cotton, American machinery, American inventions in all the mechanical arts, have given us a commercial prestige unequaled by any other nation. In fact, our material progress has been so rapid, the growth in the volume of our wealth and commerce so phenomenal, that many persons become dazzled, and see only these in the forces that have placed this nation in the front rank, if not leading the nations of the world. This in part is true, but great spiritual and humanitarian impulses have always preceded and underlain material prosperity. The fact that this country offered to men of independent thought, men striving to worship God in spirit and in truth, an asylum from persecution and bigotry, was a greater inducement to the very class which has been the backbone of our nation than was the opportunity to amass wealth. Of the thousands who crossed the Rockies, the major portion, who went purely in search of the gold of California's mines, were largely unruly adventurers, who did little to develop the country, while Marcus Whitman and the missionaries who followed in his trail dotted the land with colleges and churches, institutions which have developed the men who are today the strength of the West, and who are clamoring more loudly than those of any other part of our country for the rights of men and the protection of women and children. It is on these attainments that we should pride ourselves, because in such accomplishment is to be found the only sure foundation for the permanence and stability of our nation.

In foreign cartoons America is frequently represented by the hog, because of the so-called lack of culture of the American man and the greediness of many of our financiers. But the unselfish qualities of the average man are reflected in our diplomacy which refused to accept more indemnity from China after the Boxer rebellion than was literally needed for reparation, that not only set Cuba free from the yoke of Spain, but banished her most dreaded foe, yellow fever, and as soon as she was able to stand alone retired without one concession in payment. Today our chief executive is giving special emphasis to our big-brother attitude toward the nations near us. It is these things which cause our hearts to glow with pride rather than statistics of our bank clearings, exportations, etc. And in this striving for the ideal rather than for the purely utilitarian, for the altruistic rather than the mercenary, for the good of the profession and through that the benefit of all men, rather than the mere amassing of wealth, the great men of the medical profession always have been marked.

Hundreds of medical heroes, for the improvement of the theory and practice of saving or prolonging human life, have suffered impaired health and even death, have gone into disease and pest-ridden communities at the imminent risk of their own safety, like the hero, the life-saver in every walk of life. Perhaps the most striking instance of this heroic sacrifice for science and humanity occurred when three comparatively young, but certainly very well trained and useful army surgeons—Ried, Carroll, and Lazier—conspired together in Cuba to prove to the world a theory which they themselves had partly developed as to the cause of yellow fever. They agreed that each should be inoculated by a mosquito which had bitten a yellow-fever patient during the first three days of the disease, and had been allowed twelve days for incubation afterward. Ried was called to Washington and did not take his mosquito. Carroll and Lazier contracted yellow fever as a result of their bites, and both died. Lazier was the first to succumb, and Carroll some time afterward. Later Ried, too, died—no doubt as a result of his trying compact and desperate sorrow. As valuable as is a trained human life, the sacrifice which these men made seems amply repaid in the saving of millions upon millions of dollars which yellow-fever epidemics would have cost, to say nothing of thousands of lives they have protected and the freedom from

danger they have secured in the construction of the Panama canal, the most useful and gigantic engineering proposition the world has ever known.

We all recall the wonderful work of Dr. Trudeau at Saranac, N. Y.; he was himself a consumptive, and ill, yet nevertheless established a colony and sanatorium where numbers have been cured of the "great white plague."

There is no gainsaying the fact that professional privileges bring with them very serious, yet, withal, most honorable and ennobling responsibilities. A profession is necessarily benevolent, because of itself and its science being most certainly made up of the benevolence of others; made up of treasures intrusted to its members, as trustees, to be used for the betterment of humanity as a whole.

Less conspicuous perhaps, but not less useful than the medical profession, are the army of men and women, workers in charity organizations, children's playgrounds, visiting nurses' associations, etc., who serve their fellows and bring aid and comfort in times of distress, affliction, and disease. What an unwholesome and uncomfortable place this world would be to live in but for such service, and what a great need there is that it shall be rendered in more abundance! We as a generation are passing, and are today perhaps beyond reclaim, but the child comes on at rapid pace—to make or mar our nation, to elevate or degrade our race.

President Wilson has said:

> The human race is not to be saved by a remnant; the human race is not to be saved by a few instructed persons, but it is to be saved by the consciences and purposes of common men. If you cannot carry the instinct of the common man with you, then you have done nothing to increase the forces or to enhance the hopes of the nation.
>
> And so, in studying the interests of Atlanta, you are studying the interests of Georgia, you are studying the interests of America; you are trying to set yourself the standards which, as they spread from community to community, will call men's thoughts back to these fundamental things for which we live.
>
> We do not live for material success. Not one of us has ever been satisfied for a single moment by material success. We live in order that our spirits may be serene. We live in order that days may come in which, when our work is over, we may look our fellow men in the eyes with unfaltering gaze, and when we shall come to the brink of the grave and go down into its depths, that we may know that we, at least, have done our little parts to see that men are elevated to the uplands of vision and unselfish achievement.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE USE OF NITROUS OXID AND OXYGEN FOR PAINLESS DENTISTRY.

By JEROME G. HESS, D.D.S., Lancaster, Pa.

THE active part taken by dentists in the discovery of general anesthesia is a matter of historical record, and it is to be expected, from the painful nature of their work, that they should put forth every effort in perfecting agents and methods for the relief of pain. It is very gratifying, therefore, to observe the results obtained in the use of nitrous oxid and oxygen for this purpose.

Various general and local anesthetics have for many years been in use in dentistry for extracting teeth and for small oral operations, but nothing has been used with success for the relief of pain in the preparation of cavities for filling teeth until three years ago, when the

combination of nitrous oxid and oxygen was introduced for such work. Nitrous oxid has been used in its pure state for the extraction of teeth since as early as 1844, but it could not be used to advantage for a sufficient length of time to do prolonged operations. The discovery of the combined use of nitrous oxid and oxygen is as helpful in modern dentistry for the relief of pain as that of ether or chloroform in surgery.

The fear of pain has kept thousands of people from having their teeth attended to until an exposed pulp, abscess, or some dental disease compelled them to seek the services of a dentist. With nitrous oxid and oxygen the dentist can produce a state known as analgesia. In this condition the patient maintains consciousness, and has full possession of his mental faculties throughout the operation. He sits calmly and restfully in the chair, knowing that the work is being done, but feels no sensation of pain.

This anesthetic is, in the hand of an experienced operator, safe, pleasant to take, and entirely free from after-effects. Analgesia can be varied in depth according to the requirements, and can be prolonged for any desired period of time.

By the use of nitrous oxid and oxygen for the relief of pain, the dentist can thoroughly remove all carious portions from the teeth, impart to the cavities a better retentive shape for the kind of filling selected, and do more work in the same amount of time with a degree of satisfaction which can only be appreciated by that class of patients who have given this method of modern dentistry a trial.

During a period of two years I have given 756 administrations of nitrous oxid and oxygen for analgesia. Ninety per cent. of these analgesias were perfect, nine and one-half per cent. of cases were benefited by its use, and ½ of one per cent. of cases were entirely unsatisfactory. In the last class a few were nauseated, not from the gases alone, but owing to an abnormal physical condition. After the nausea had worn off, most of these patients felt fine, and upon leaving the office continued their regular routine of business for the balance of the day. One patient, whose history showed a low physical and nervous condition for the past few years, was partially exhausted, and showed slight symptoms of hysteria at the close of a forty-minutes administration of this agent, but after several hours regained her usual physical state. In this case the work had been done without any pain.

As illustrating the remarkable results obtained by this treatment, a perfect case, "Miss W.," might be more fully described. This patient was unusually nervous and slightly hysterical, her pulse being 112. In this case, caution and an accurate diagnosis were essential for obtaining perfect results in the administration of nitrous oxid and oxygen, and by one not thoroughly familiar with the various symptoms indicated, difficulties would have been encountered. Four minutes after the valves of the nitrous oxid and oxygen apparatus were opened, perfect analgesia was produced. The operation consisted of the removal of the pulps from the two upper central incisors and the preparation of a large interproximal cavity on the upper left second bicuspid. The duration of the administration was fifty-two minutes. The patient was absolutely free from pain, yet maintained full possession of her mental faculties, which was evidenced by her intelligent response to any suggestions required during the execution of the work. At the close of the period she left the office free from any ill effects whatever. This case, while it is only one of many of similar character, shows the great need of an agent for the elimination of pain in the conservation of teeth which otherwise would have to be neglected or sacrificed.

Nitrous oxid and oxygen anesthesia and analgesia are not confined alone to the filling and extraction of teeth, but can be used to great advantage in oral prophylaxis, especially so in the preliminary treatment of pyorrhea, since thorough cleansing of the teeth in a diseased condition of this character with-

out the use of an agent for the relief of pain is almost unendurable. In subsequent treatments of such pathologic conditions, however, it is usually not required, unless in very unduly nervous subjects, when it will be found of great service in the injection of either emetin hydrochlorid or a vaccine.

EMETIN—ITS POSSIBILITIES.

By Dr. T. F. COYLE, Orange, Texas.

THE article of Dr. Bass and Dr. Johns on "Pyorrhea Dentalis and Alveolaris: Specific Cause and Treatment," published in the *Journal of the American Medical Association* of February 13, 1915 (see "Review of Current Literature," DENTAL COSMOS, April 1915, p. 460), inspires me to sound a warning. While realizing my limitations, in the absence of a stronger defender I am constrained to make an effort to save emetin from its friends.

In my opinion, Dr. Bass and Dr. Johns are over-zealous, and I am afraid that the method they advocate will defeat the ends they seek. Their viewpoint is that of the physician, and while their scientific attainments command the profound respect of the medical and dental world, they do not possess that intimate acquaintance with the condition they seek to relieve that is possessed by the dentist only. This fact could not be better shown than in their incidental reference to dental treatment in the paper referred to: "No doubt proper dental treatment, consisting of cleaning and scaling the roots, removing dead and denuded alveolar process, and cleaning out large pockets, will prove of value. . . . We doubt whether one could find all the small lesions in most cases of pyorrhea, much less make local applications to them." The dentist who has developed that delicate sense of touch, that high order of skill essential to the removal of all foreign deposits from the inaccessible bifurcations of molar roots, will smile at the above quotation.

No case of pyorrhea has ever been cured as long as a particle of calculus remained, as long as overhanging fillings, crowns, or absent contact points were the contributing causes—and these are responsible for almost all primary lesions. Emetin will not remove calcarious deposits, make misfit crowns fit, polish rough and overhanging fillings, nor restore lost contact points.

He who regards dental interference as a remote help, as a possible benefit only, makes a fatal mistake. The physician who invades this field does so totally unequipped to meet conditions. I regard emetin as the most valuable remedy yet used in the treatment of pyorrhea, but the dentist or physician who trusts emetin, and emetin alone, to effect a cure is doomed to disappointment. He may inject one, three, or six cubic centimeters or a gallon of it, and record a failure, through no inherent fault of the drug.

Were I facetious, I would suggest to those who hope to be relieved of the countless hours of soul-trying operative endeavor, that they procure a vessel of ample dimensions, filled with emetin—the per cent. being immaterial—submerge the patient until the bubbles cease to come, and leave him in over night to be sure. When using emetin in that way they will be safe in throwing away their instruments and forgetting their technique.

Seriously, if the dentist does his work skilfully and thoroughly, he may depend upon emetin as a most valuable adju-

vant. I think the exclusive hypodermic use of the drug irrational.

Dr. Bass and Dr. Johns, in the above-mentioned paper, refer to the habitat of the endamœba as being dead and dying tissue. This finding led me to combine the Barrett and Bass-Johns treatments, which in my opinion is a most rational procedure. I am using intravenous injections and local applications in pockets on alternate days, and secure excellent results. I found the subcutaneous and intramuscular use of the drug quite painful, making its continued use impracticable, which suggested the intravenous method. I have employed it in several hundred administrations, and find it most effective, and devoid of its most objectionable symptoms after continued use. I would suggest the more general adoption of this method, which appears to be a most direct means of reaching the endamœbæ in the circulation, while the injection into the pocket destroys those not reached in the bloodstream.

To summarize: For bringing about a cure it is most essential to remove all mechanical predisposing causes. A surgeon would not leave a foreign body in a suppurating wound in any other part of the body and expect favorable results. Pockets must be eliminated to avoid reinfection, and intelligent use and not abuse of emetin be made, which embraces its local and intravenous administration, until complete recovery takes place.

PYORRHEA ALVEOLARIS.

By J. W. NEEDLES, A.M., M.D., D.D.S., Pueblo, Colo.

(Read before the Pueblo County Medical Society, September 29, 1914.)

PYORRHEA alveolaris is one of the most prevalent, if not the most prevalent of human diseases. It is also one of very great importance, both because of the number of teeth which it destroys and the influence which it exerts upon the general health; and because of the serious nature of the complications and sequelæ which are due to it, it is at least as important to the medical profession as it is to the dental profession.

DEFINITION.

According to Dorland, "pyorrhea alveolaris is a purulent inflammation of the dental periosteum, with progressive necrosis of the alveoli and looseness of the teeth." This is a very concise and serviceable definition, and, with proper interpretation, a very accurate and comprehensive one. It is necessary, however, to read into some of its terms very specific meanings, in order to make it cover the most recent and scientific conceptions of the disease. It is distinctly a disease of man, as it is not found in the lower animals, and is experimentally produced in them with difficulty.

ETIOLOGY.

The etiology of pyorrhea is a very much debated question, though it will probably be settled in the very near future. The theories that have been advanced most often in the past have been built largely upon one single factor in the etiology, and have not given full weight to other equally important features. These divergent views are coming to be reconciled by recent studies which show certain factors to be predisposing or contributory, and others exciting. Pyorrhea must now be considered to be essentially an infectious disease due to one of several organisms, the most prob-

able of which are the pneumococcus, the streptococcus, and other pyogenic organisms, or the endamœba buccalis.

The predisposing causes are mechanical irritation of the gums and the peridental membrane by tartar, the rough edges of cervical cavities, trauma from the impaction of food due to approximal cavities or irregularity of the teeth, poorly fitting crowns or protruding fillings. Of the constitutional diseases, gout, rheumatism, diabetes mellitus, nephritis, disordered metabolism, and debilitating diseases may be mentioned as predisposing causes.

Tartar is of two kinds. The salivary tartar is composed of calcium phosphate or carbonate, and mucin or another organic binder. This form of tartar is of light color, massive, and friable. The serumal calculus, derived in part from the blood serum, is composed of urates, triple phosphate, calcium phosphate or carbonate, blood pigment, and an organic binder. This form is dark colored, occurs in smaller masses, and is denser and more deeply embedded in the tissues. Both forms contain bacterial remains and tissue débris. Because of the altered secretions, gout and rheumatism predispose to the formation of serumal calculus. Age is a predisposing factor, as severe cases of the disease are seldom seen in patients below thirty years of age; after this age it becomes progressively more common, so that at the ages of forty-five or fifty very few people are entirely free from it. All the severe infectious diseases, especially pneumonia, typhoid fever, tuberculosis, syphilis, and malaria, favor the contraction of pyorrhea, since they lower the resistance to infection.

The disease is essentially chronic, though it may originate in an acute gingivitis, and is subject to acute exacerbations. It runs a course of from ten to twenty-five years, and without adequate treatment ends with the exfoliation of all the teeth.

PATHOLOGY.

A clear understanding of the pathology of pyorrhea alveolaris requires a somewhat detailed study of the relation of the teeth to their supporting tissues; that is, the histological relation of the teeth to the gums, peridental or pericemental membrane, and the alveolus. The cementum covers the surface of the dentin apically from the border of the enamel, lapping slightly over the enamel at the gingival margin. The function of the cementum is to furnish attachment to the fibers of the peridental membrane or ligament which holds the tooth in its socket. Fibers of the peridental membrane penetrate through the layers of the cementum, and are calcified with it.

THE PERIDENTAL MEMBRANE.

While this tissue performs the function of a periosteum for the cementum and the bone of the alveolus, it differs in structure from periosteum, so that any name including the word periosteum or implying a double membrane should be avoided. It is nothing more than an alveolo-dental ligament, because of the fact that microscopic sections show that it is composed of solid bundles of fibers, which emanate from the walls of the alveolus and go convergently to insert themselves into the cementum of the tooth, thus forming a circular, suspensary ligament. They penetrate deeply in the form of Sharpey's fibers into the bone of the maxilla as well as into the cementum, similarly to what takes place in other tendinous insertions.

THE ALVEOLAR PROCESS.

This is not a bone distinct from the maxilla, but a part thereof. "The socket is nothing more than an enlarged medullary space of the maxilla with a thinned-out edge forming the alveolar process."

The disease begins as an inflammation of the gum margin, and gradually involves the peridental ligament or membrane and the alveolar wall, which latter becomes necrotic. The process is then in the nature of a chronic alveolar osteomyelitis. The general and me-

chanical causes of the disease have been discussed, leaving only the infectious. The mechanical causes are by far the most important in starting the disease, but less important in keeping it up. It is the local infectious causes, on the other hand, that are the most important in continuing the process.

All of the common pyogenic organisms have been isolated from cases of pyorrhea, and indeed nearly all cases exhibit a mixed infection. The most logical micro-organism to suspect as the cause of pyorrhea, because with careful technique it is found in nearly all cases, and because in other parts of the body it produces lesions of a similar character, is the pneumococcus. As found in this location, it occurs as a diplococcus or in very short chains. Medalia found it 107 times in 112 cases. He describes it as the pneumococcus in chains, or as the streptococcus lanceolatus pneumoniæ. The germ is very difficult of growth, and has only a low degree of virulence. There is a close relationship between this form of pneumococcus and the streptococcus. E. C. Rosenow and Frank Billings, in studying the etiology of gastric ulcer and chronic arthritis, have shown that there are several types of streptococcus, and that these may be changed from one form to another by varying the cultural conditions. Three of the strains taken from rheumatics have been changed into typical pneumococci. These strains may also be isolated from pyorrhea pockets and the crypts of the tonsils. This shows a possible relationship between pyorrhea and gastric ulcer, chronic arthritis, endocarditis, pericarditis, pneumonia, and similar infectious processes. Rosenow showed a similar infectious origin in 35 out of 38 cases of arthritis deformans. Crile, Roswell Park, John B. Murphy, and many others emphasize the connection between joint infections and infections of the tonsils and gums. A similar indication of relationship is shown by the greater severity of pyorrhea following pneumonia. Many of these diseases show very marked improvement following treatment of the pyorrhea, especially when autogenous vaccines are used. In pyorrhea, other pyogenic germs are frequently if not always associated with the pneumococcus.

Two notable contributions to the pathology of pyorrhea have been made within the last few months. One by M. T. Barrett and Allen J. Smith of the pathological laboratory of the University of Pennsylvania (Dental Cosmos for August 1914, p. 948), the other by Professor Chiavaro of the dental department of the University of Rome (Dental Cosmos, September 1914, p. 1089). These two series of experiments were conducted entirely independently, though they have been announced almost simultaneously and verify each other to a remarkable degree. Drs. Barrett and Smith show that in forty-six cases of suppuration affecting the gums and the peridental tissues which they examined up to the time of their report, in every case an actively motile parasitic amœba was found. This endamœba they have identified as the endamœba buccalis, which had previously been described by several writers. In several apparently healthy mouths which they examined they were unable to find the organism. To determine any causative relation which the organism might have, they decided to try emetin hydrochlorid as an amœbicide, because of the results obtained with this drug in amœbic dysentery. The pyorrhea pockets were irrigated with a ½ of one per cent. solution of emetin hydrochlorid. In several of the thirteen cases thus treated, the pus disappeared completely in twenty-four hours; in all, after three daily treatments. After the second or third treatment, the tissues took on a more healthy appearance, the teeth became firmer, and the endamœba disappeared. In the short time since this article was published I have been able to find the endamœba in pyorrhea, and also to demonstrate the improvement following emetin treatment.

The article by Professor Chiavaro deals with the relationship of the endamœba buccalis to pyorrhea, and calls special

attention to the morphology and the life-history of the organism; but while Barrett and Smith regard the endamœba buccalis as highly pathogenic and one of the exciters of the inflammatory condition present in pyorrhea, Chiavaro considers the endamœba as a scavenger, owing to its phagocytic activity, and believes it to assist in protecting the tissues of the mouth against bacterial invasion. The correctness of the opinion of Barrett and Smith, however, in regard to the pathogenicity of the endamœba buccalis has been confirmed not only by a new series of experiments and abundant clinical experience of these writers (Dental Cosmos for December 1914, p. 1345, and January 1915, p. 101), but by the microscopic and clinical findings of Bass and Johns (Dental Cosmos, January 1915, p. 101; February 1915, p. 223), and the clinical experience of a rapidly increasing number of dental practitioners who are giving emetin hydrochlorid a thorough test.

SYMPTOMS.

The main symptoms are an inflammation of the peridental membrane, bleeding of the gums at the slightest touch, a tendency of the teeth to elongate and to be painful to pressure, often associated with a dull, continuous ache. Loosening of the teeth in their sockets, accumulation of tartar about the teeth, the formation of deep pockets between the gums and the teeth, discharge of pus from these pockets, and an occasional abscess, a foul breath, and a coated tongue are characteristic of the disease; constipation and intestinal putrefaction are almost constant.

DIAGNOSIS.

Pyorrhea must be distinguished from acute gingivitis, which it often follows, also from necrosis of the alveoli due to lead poison, scurvy, and mercurial stomatitis. The lesions of syphilis and tuberculosis are sometimes found in the mouth.

PROGNOSIS.

The destruction of the alveolus and the looseness of badly affected teeth cannot be remedied, but the active process can be stopped, and teeth which are not too badly crippled can be made comfortable and useful for many years. Early cases and those without too much destruction of tissue yield as high as 90 per cent. of cures under local treatment and autogenous vaccines; advanced cases give about 40 per cent. of cures. Relapses or recurring attacks often take place, as the constitutional and predisposing causes may remain unchanged.

Prophylaxis is of the greatest importance, as the disease may be entirely avoided, or, if recognized early, very much more successfully treated. The prevention of the disease depends upon scrupulous cleanliness of the mouth and in having the teeth kept in the best condition. Regular visits to the dentist at least once a year for the removal of causes of local irritation and the overcoming of any incipient trouble are very important.

TREATMENT.

The treatment consists in thorough cleansing of the teeth by mechanical and chemical means, removal of any local irritation, such as broken roots, rough edges of cavities, or protruding fillings, poorly fitted crowns, and so forth. The after-treatment consists in keeping the pockets washed out with mild antiseptics and local applications to stimulate healthy granulations and to overcome infection. It is sometimes necessary to support the teeth by splints of various kinds. Massage of the gums is very valuable, both as a stimulant and as a means of producing auto-inoculation. Systemic treatment is necessary to overcome faulty metabolism. Predisposing constitutional diseases often need treatment. At the present time, autogenous vaccines combined with local measures give the best results. The treatment with emetin hydrochlorid may prove to be almost a specific.

CONCLUSIONS.

(1) Pyorrhea alveolaris is in reality a chronic alveolar osteomyelitis; it should be known and treated as such.

(2) Mechanical causes are responsible for starting the disease, while systemic diseases and local infection are responsible for keeping it up.

(3) Pyorrhea is a specific disease, though its etiology cannot be ascribed to any one single organism.

(4) A great many rheumatic diseases, so called, and a great many gastro-intestinal conditions, are directly related to pyorrhea. The importance of oral sepsis to constitutional disease is just beginning to be appreciated.

(6) The treatment of pyorrhea, especially with autogenous vaccines, with proper attention to diet, relieves or cures these systemic conditions, as well as cures the pyorrhea.

(7) The near future promises to bring forth a more exact knowledge of the etiology, and possibly a more effective treatment of pyorrhea alveolaris.

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CORRESPONDENCE.

DR. BUCKLEY'S DESENSITIZING PASTE.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—Allow me to give you a brief history of my experience with Buckley's desensitizing paste. I used it for some time without any disagreeable results, but of late, and with the same material I at first used, I have had many cases of pulp hyperemia and a few cases of devitalization. I would not think of using it in the cavity very near a pulp, for it is almost sure to devitalize the tooth when so used, but I have had not a few cases of severe pulp irritation—some transient and some persistent—even when it was used in shallow cavities.

There is no question as to its efficacy in obtunding dentin in any cavity, but it seems almost impossible to determine when it is safe to use it and when not. I believe thoroughly in the honesty and good intent of Dr. Buckley, but I fear that his statement in regard to the impossibility of the paste causing devitalization was rather premature.

I think you will find others have had a similar experience to mine, and I write this as a warning to those who are experimenting with this material, to use it with great caution. I was very enthusiastic about it at first and used it a great deal, but I must confess that I am now somewhat disappointed in it. I

have never had so many cases of pulp irritation on hand as I have had lately, and am thoroughly convinced that this is due solely to the use of the paste.

Dr. Buckley has done much for dentistry in teaching us the advantages of the formocresol treatment, and he deserves unlimited credit for that discovery or propaganda, but I fear he has made a mistake in claiming so much for the desensitizing paste.

ALFRED R. STARR, M.D., D.D.S.
10 E. 92D ST., NEW YORK CITY,
April 3, 1915.

"SYMMETRIC CARIES."

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—I trust it will not be considered hypercritical if I call attention to what seems to me to be a rather superfluous and unacceptable theory of symmetric caries. I refer to the article by Dr. Wechsler, "Symmetry in Dental Caries," in your March issue, page 270.

The explanation of this condition seems to me to be simpler than the very vague one advanced. Were caries endogenous, the sympathetic theory might carry some weight, but who can suppose that any nervous irritation is able to alter the susceptibility of enamel to the external agencies which we know to cause decay? An analogy is drawn between this condition and optic neuritis which does not hold good, as, supposing that the eyes were affected from without, as from germ-laden dust, resulting in inflammation, should we assume that first one eye was affected and the other became affected by way of sympathy, or should we accept the more rational explanation, *i.e.* that both were acted upon by the same common cause?

Once we allow that germs cause decay, what is more natural than that "twin" teeth, the follicles of which are formed at the same time, erupt at the same time, and are subjected in the mouth to the same environment for a given period of time—what could be more natural than that they should succumb to the same disease? Of course, exceptions are very numerous, sufficiently so to almost dispose of any central cause, and they are easily explained by the habits of the patient, especially in the use of the brush and in mastication, also by accidents to the teeth and by slight anomalies of formation and position.

Furthermore, the writer of the article in question does not explain why it is that these impulses of irritation, when carried to a central ganglion, are thrown out to the *mate* of the tooth affected rather than to *any tooth* on that side of the jaw?

Respectfully submitted,

W. A. KERRISON.
REARDAN, WASH., March 15, 1915.

"A PROBLEM IN ANCHORAGE."

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—In the March 1915 issue of your journal, Dr. Lawrence W. Baker of Boston presented a paper entitled "A Problem in Anchorage." (See pp. 249, 250.) The doctor concludes his article by stating, "I bring this method before you this morning as a *contribution to the principle of anchorage* in orthodontia." [Italics mine.]

I have read the article, and fail to find any references to similar "contributions" in our literature. Now, if you will turn to page 196 of the January 1909 issue of *"Oestr.-Ungar. Vierteljahrsschrift f. Zahnheilkunde,"* you will

find an excellent illustrated description of the "principle of anchorage" of which Dr. Baker writes, by Joseph Grünberg of Berlin. Several other writers have described this principle in similar fashion, and I regret to see it brought out now as though it were new.

"How long, oh! how long" will it be before men will take the time to learn something of the history of our art? I cannot help but conclude that this is another evidence of the pernicious "handicap on thought" which orthodontic orthodoxy has produced. Will we ever rid ourselves of the narrow viewpoint of the "systems"?

B. E. Lischer.

St. Louis, March 12, 1915.

INFORMATION REGARDING THE ARMY DENTAL SURGEONS CORPS.

To the Editor of the Dental Cosmos:

Sir,—In replying to Dr. Scheiman's inquiry, published in the Dental Cosmos, January 1915, p. 72, I shall endeavor to answer briefly his questions regarding the army dental corps.

As to the exact nature of the services that the members of the army dental corps are called upon to render, they are required to do all that any general practitioner in civil life would have to do, provided they are stationed at a large post and furnished with a complete equipment. When in the field, or traveling with a field equipment from one small post to another, the scope of the army dental surgeon's work is of necessity limited to oral prophylaxis, the filling and treating of teeth, and such minor operations as his limited time and equipment will enable him to perform.

Of the ninety-two candidates who presented themselves for the past three examinations, eleven failed physically, eight withdrew, forty-four failed either in mental or clinical work, and twenty-nine passed. The actual length of time spent in civil practice by these twenty-nine averaged two years and eight months. The law requires that a man be not over twenty-seven years of age when entering the dental corps. At the last examination held there were ten successful candidates, but it was possible to give contracts to only seven of them, as the act of Congress making appropriations for the fiscal year ending on June 30, 1915, made provision for only forty acting dental surgeons. The report of the Adjutant-general, United States army, June 30, 1914, gives the strength of the army as 92,877 enlisted men and 4883 officers. The law allows one dental surgeon to each thousand men of the actual enlisted force of the army, so that, if the corps were filled on the basis of the 1914 report, it would consist of ninety-two dental surgeons, sixty of whom can become first lieutenant dental surgeons, the balance remaining acting dental surgeons until a vacancy occurs.

S. D. Boak, M.D., D.D.S.,
Dental Surgeon U. S. Army.

PROCEEDINGS OF SOCIETIES.

DENTAL FACULTIES ASSOCIATION OF AMERICAN UNIVERSITIES.

Special Meeting, held at Philadelphia, February 24 and 25, 1915.

FIRST SESSION.

A SPECIAL meeting of the Dental Faculties Association of American Universities was called to order on Wednesday, February 24, 1915, at 10 o'clock A.M., by the president, Dr. Hoff, in the Evans Institute, Philadelphia, Pa.

Dr. Breene was on motion made secretary *pro tem.* in the temporary absence of Dr. Kirk.

Members present during the sessions were Dr. Alfred Owre, University of Minnesota, College of Dentistry; Dr. F. T. Breene, University of Iowa, College of Dentistry; Dr. N. S. Hoff, University of Michigan, College of Dental Surgery; Dr. Edward C. Kirk, University of Pennsylvania, School of Dentistry; Dr. E. H. Smith, Harvard Dental School; Dr. J. H. Kennerly, Washington University, Dental School.

During the different sessions the following visitors were present: Dr. C. R. E. Koch, Northwestern University Dental School; Dr. W. P. Cooke, Harvard Dental School; Dr. L. M. S. Miner, Harvard Dental School; Dr. H. M. Semans, University of Ohio Dental School; Dr. Hermann Prinz, University of Pennsylvania School of Dentistry; Dr. Eugene S. Talbot, Chicago.

Dr. HOFF read the call for the meeting, setting forth the objects of the present special meeting, as sent out by the Executive Committee.

The president, Dr. N. S. HOFF, then read his address, as follows:

President's Address.

By N. S. HOFF, D.D.S.

Members of the Dental Faculties Association of American Universities meeting in Special Session,—We are convened in special session today in response to the call of our Executive Committee, to further consider the resolution adopted at our last annual meeting in Minneapolis, March 21, 1914, in the matter of extending the college curriculum to four years; and also to consider such other pertinent matters as may properly come before us at this time.

In view of the fact that our dental announcements are usually printed in June, there can be no sufficient notification to prospective students until June 1916, too late to enable them to prepare for the course. For this reason your Executive Committee thought it necessary to call this special meeting at this time and place. I trust every college holding membership in this association is represented by a duly authorized delegate who has come prepared to act definitely on this important question now before us for final decision. This is necessary before we can intelligently discuss the details of administration.

At the annual meeting a suggestion was made that the action taken by this body and the advisability of similar action by all dental colleges should be brought to the attention of the National Dental Association and the National Association of Dental Examiners. This I

believe our secretary did in a formal communication, and your president had a personal interview with the president of each of these organizations, in which he urged them to make such recommendations as they deemed the cause justified, in their respective addresses to these bodies. As you are all doubtless aware, the matter received much favorable comment in both of these organizations at their annual meetings. We have also done what was possible by personal interviews and correspondence with various executive officers of colleges and other dental organizations that are especially interested in this subject, and there seems to be no difference of opinion in the minds of the majority of thoughtful teachers and professional men as to the necessity for more time for the administration of a proper and adequate course of instruction that shall qualify for the practice of modern dentistry.

The National Dental Faculties Association, at its annual meeting recently held, decided, after a careful and rather strenuous debate, with final and practical unanimity, to inaugurate a four-year course of instruction, beginning with the college year of 1917–18.

Two of our dental editors have editorially commented on this proposition adversely. We have not seen or heard any other adverse comment. It would seem from these facts that our action last year was timely, and that we should complete the initial move by adopting such further measures at this time as may be needed to carry our resolution into effect.

It has been suggested that it might be diplomatic, and that we should serve our cause more effectively, should we postpone the inauguration of the four-year course another year until all the schools were ready to join in the movement. This would undoubtedly give us more time to perfect our plans, and would also give time for the necessary amendment of our registration laws to conform with the new course. This would also make it easier for some colleges to prepare for the change, and give the prospective student a chance to make his preparations.

On the other hand, the seven schools of this association have, tentatively at least, committed themselves to the course for the session of 1916–17, and two of them have actually announced it. Also the Northwestern University Dental School has decided to start a four-year course, beginning with the session of 1916–17. In view of these facts and our published action, would it be wise for us to hesitate? Can we afford to lose the time and risk the possibility of a reversal of the action taken by the other schools? Have we any assurance of favorable legislation unless we first demonstrate to the profession the value of more time for instruction, and its practicability?

No doubt we have all been looking forward to this four-year course as a means of making our teaching work more efficient, and I am aware that much time and thought has been spent in formulating a more efficient course of study by several of our executive officers, with the hope of definite action at this meeting.

Our Educational Committee presented a suggestion for an ideal curriculum at our meeting last year, which with new suggestions may serve at this time as a basis for our discussion. We should all have well-conceived ideas that may be helpful in arriving at the best conclusion, and it is only by the exchange of ideas and their critical examination that we shall be satisfied with the action we may take in regard to this most important movement. In other words, we should have a full and free discussion of this matter from every standpoint—the pedagogic, the practicable, and most of all, from the ideal. If it should become possible for us to devise a practicable and ideal curriculum we shall have accomplished, it seems to me, all that this time and occasion demands.

It is the tradition of this body, based upon an article of our constitution, that the largest possible freedom of internal

management shall always rest with the individual membership. Therefore we can and should discuss this problem unhampered by any possible legislation that may lead to personal embarrassment to any of our members.

Owing to the fact that a full representation of the membership of this association may not be possible at the regular annual meeting this year, because of the great distance, it may seem desirable for us to consider at this meeting some items of business that should more appropriately be deferred to the annual meeting. By the unanimous consent of those present it seems to me that it would be proper, and we should feel competent to take any action that may be necessary at this meeting to effectively forward the interests of the association. Any or all such actions may and properly should be submitted to the annual meeting for ratification, or for reconsideration if occasion demands.

Your president has taken the liberty of inviting to this meeting representatives from the dental colleges connected with Ohio State University, Illinois University, and Northwestern University. As these schools are qualified for membership in this association, and are not connected with any other similar body, and as each has expressed a desire to extend the curriculum to the four-year course, I felt that we should have the benefit of their counsel on this occasion. I trust it may be the pleasure of this body to extend a cordial invitation to the representatives of these, and any other such representatives as may be present, to join us in our deliberations as to ways and means for putting into effect, in the best possible manner, whatever advance in the dental curriculum we shall see fit to adopt.

Dr. Owre moved and Dr. Smith seconded that the Address of the President be accepted and approved. [Motion carried.]

With regard to the action of the president in extending invitations to the University of Illinois Dental Department, the University of Ohio Dental Department, and the Northwestern University Dental Department to send representatives to the meeting, Dr. Kennerly moved that the action be indorsed by the association. [Motion carried.]

Dr. Smith moved that the gentlemen representing these schools invited be given the privileges of the floor. [Motion carried.]

The next order of business was the reading of the report of the Secretary-Treasurer, as follows:

Report of the Secretary-Treasurer.

By Edward C. Kirk, D.D.S., Sc.D., LL.D.

Mr. President and Members of the Dental Faculties Association of American Universities,—As Secretary-Treasurer I have the honor to report that the subject which formed the principal topic of discussion at the previous meeting of our association, namely, the desirability of lengthening the dental curriculum to four years, has been the subject of correspondence, indicating an increasing interest in the problem and a wholesome degree of activity favorable to the addition of another year to the time of the present curriculum.

Pursuant to the instructions of this association, expressed in a resolution at the Minneapolis meeting, directing the secretary to communicate the views of the association favoring the plan of lengthening the course, to the president of the National Dental Association, the president of the National Association of Dental Examiners, and the president of the Pennsylvania State Dental Society, communications were sent by the secretary to each of the officers designated, setting forth the principal reasons why our association, generally speaking, was favorable to the adoption of an additional year, and asking that the subject be brought before the respective associations for consideration. The president of the National Dental Association, Dr. Homer C. Brown, embodied the main features of the argument as presented by your secretary, in

his annual address, and after discussion by the National Dental Association the question brought forth an expression of opinion favorable to the plan suggested, which was embodied in a resolution by our National body expressive of its approval of the suggestion to make the standard dental curriculum of dental study four academic years in length.

The president of the Pennsylvania Dental Society, Dr. Howard S. Seip, in his annual address strongly recommended favorable action by the Pennsylvania State Society, and a similar vote of approval was passed by that body.

No acknowledgment of the receipt of your secretary's letter was received from the president of the National Association of Dental Examiners.

Copies of the correspondence involved in the foregoing are on file for your consideration if desired.

From the University of Minnesota, College of Dentistry, through its dean, Dr. Owre, your secretary received notification under date of August 21st that at its meeting on June 10th, the board of regents of the University of Minnesota adopted the following resolution:

VOTED, That it is the sense of the board that if the majority of the dental colleges in the Association of University Dental Faculties decide to adopt a four-year course, the University of Minnesota will be favorably disposed toward such an extension of the dental course.

Dean Owre has forwarded to the secretary several communications having an interesting bearing upon the question of the four years' curriculum. Dean Owre has sent to the secretary a detailed exhibit of a proposed distribution of work over the several years of the four years' curriculum, copies of which have doubtless been received by all of the members. A consideration of the plan proposed by Dr. Owre may properly be the subject of discussion at the present meeting.

As bearing upon the question of admission requirements, the University of California Dental Department, through its dean, Dr. Millberry, forwarded to the secretary under date of November 18th the report of the Council of the University of California, embodying a statement of advanced requirements for admission to the College of Dentistry of the University of California, to become effective at the beginning of August 1917. The report is not sufficiently clear in itself, requiring for its interpretation reference to the official announcement of courses of the university for 1914–15. A detailed exhibit of the character and extent of the advanced entrance requirements authorized for admission to the Dental School of the University of California is on file with this report for your consideration.

Your secretary has received communications from the registrar of the University of Alberta, Canada, also from the secretary of the Manitoba Dental Association, making inquiry into the status of American dental colleges, with a view to the preparation of a selected list of schools in the United States the educational work of which may entitle them to recognition by the licensing bodies of the Canadian provinces named. Information concerning the schools in the membership of our association was furnished in answer to these inquiries, and for information regarding those outside our membership the correspondents were referred to the secretary of the National Association of Dental Faculties. The correspondence in connection with this matter is on file for your consideration, if it be desired.

Also a communication from Dean Kennerly of the Washington University Dental School, with reference to the possibility of granting credit for work done toward the Bachelor of Science degree and agricultural course to apply to advanced standing in the dental course, the work done by the applicant having included certain credits in chemistry, physics, biology, and bacteriology. An opinion adverse to granting advanced standing in the case cited was transmitted to Dr. Kennerly, he concurring in the decision. Report of this corre-

spondence is made, as the point involved may be deemed worthy of official consideration in order that a definition and precedent may be established in such cases.

The secretary has received repeated requests from the authorities of the Panama-Pacific Dental Congress requesting that a definite date be fixed for our meeting in San Francisco, and your secretary would suggest that action be taken upon that question at the present meeting.

Through correspondence with Dr. Hoff, invitations have been sent to authorities of the Universities of Ohio and Illinois to send representatives to be present at this meeting.

The secretary has received a letter from Mr. Frederic G. Hallett, secretary of the Conjoint Examining Board of England, requesting information with regard to the status of the Dental Department of the University of Illinois. A letter has been sent to President James by the secretary, its receipt being acknowledged, with answers to certain inquiries made by the secretary and promising to send further information, which has not yet been received.

The secretary would direct attention to certain matters which by resolution at the Minneapolis meeting were laid over for final action at the present meeting: First, the following resolution:

RESOLVED, That undergraduate students of reputable medical schools, who have completed at least two years' work and who have credits for the full requirements in chemistry, anatomy, histology, physiology, and bacteriology, may be given credit on examination for these studies, and be advanced to the second year in the dental curriculum.

Also a report by Dean Eugene H. Smith of Harvard, as a committee of one upon his suggestion made in writing at the Minneapolis meeting with reference to the promotion of research work within the colleges of our association membership.

The financial condition of the association is set forth in the following detailed report of the Secretary-Treasurer:

Receipts:

Balance from 1913–14	$289.91	
Receipts for dues 1914–15	350.00	
Total receipts		$639.91

Expenditures:

Clerical service	$200.00	
Printing Transactions	54.61	
Stationery	2.50	
Postage	2.48	
Total expenditures		259.59
Balance 1914–15		$380.32

Respectfully submitted,

EDWARD C. KIRK,
Secretary-Treasurer.

Motion was made and carried that the report be accepted.

Dr. EUGENE H. SMITH, appointed by the association as a committee of one to report upon the question of "organized research work with the schools of the association, acting in a reciprocal way, rather than through the medium of dental societies," reported as follows:

Some five years ago, Miss Harriet N. Lowell bequeathed to the Harvard Dental School the sum of twenty-five thousand dollars, the interest of which was to be devoted to research work along dental lines. To carry out the provisions of this bequest we appointed men of research ability as a Committee on Research, and that committee has formed among the student body what is known as the Harriet N. Lowell Society for Dental Research. The object of this society is to interest students in research problems. We have at present two students doing research work along the line of pyorrhea. We are taking in as honorary fellows of the society and honorary members of the Research Committee men not affiliated with the school, but who have shown by their work their interest in the question of research. It seems to me that this can be made an important feature in our schools, and what I hoped to bring about was similar organization among dental students for research work in other schools, to the end that reciprocal arrangements might be made for the interchange of ideas, and by that means bring about better results than we could if this work was done under the direction of various dental societies.

Dr. Owre moved that the report be accepted. [Motion carried.]

Dr. Hoff read the following telegram from Dean Millberry, of the University of California College of Dentistry:

Dr. N. S. Hoff: Faculty in accord with any action leading to fourth year as preliminary or in dental curriculum. Impossible for us with present facilities to provide fourth year of dental instruction. Can do nothing without regents' action. Matter now pending in regents' committee.—Guy S. Millberry.

The next order of business was the report of the Committee on Education by Dr. Owre, chairman, as follows:

Report of the Committee on Dental Education.

By Alfred Owre, B.A., M.D., C.M., D.M.D.

The committee has found hearty support of the action of this association last year in extending the course to four years. Since then the criticisms and suggestions received as to the contents of the curriculum have led us to recommend some modifications in it.

It has been the aim of the committee to economize the student's time and energy, hence it has often been found wise to introduce studies which prepare him for a fuller appreciation of a subject rather than to lengthen the present hours devoted to it, although this has also been done in several instances. The committee has in all cases guarded against a superficial skirmish with important subjects.

We have also felt that it would be advantageous to have a program which would allow credits to be gained to some extent in accredited colleges. The studies should be designated with enough electives to develop men of power; this also allows the latitude necessary in a country where preliminary education, as well as environment, varies appreciably.

The committee has agreed upon dental faculty control of the curriculum, although the teaching of some subjects must of necessity be done as at present by the other units of the universities.

The total number of hours are increased as compared with last year's proposal, but there is a more even distribution of subjects requiring home study.

The committee has conferred widely with educational experts in allied callings, and the freshman-year program is essentially the result of such conference. While some change might easily be made in this year to make it more specifically dental in character, yet the committee feels that final action in this matter should come only after wider discussion among dental teachers and dental societies. For instance, descriptive anatomy might be given in the second semester of the freshman year, leaving out either rhetoric or the history, economics, or language group. This should be followed by offering histology and embryology in the first semester of the sophomore year, which in turn would allow operative technique to be taught in the second semester of the same year. This would, of course, also increase the available hours for practice. On the other hand, our anatomists prefer that the course in general zoölogy should be completed before beginning the study of the human body; technical drawing should also be completed before much dental work is started, since it economizes time and energy to such a large degree. Therefore if any shift is made in anatomy, it might be well to have this subject completed in the first semester, providing this is pedagogically wise. It will be noticed that substitutes are allowed in animal biology and technical drawing—we recommend in the former instance botany, and in the latter case physics. It may be advisable to substitute physics for technical drawing, or one of the cultural subjects. Furthermore, in regard to substitutes, some latitude must be given to the matriculation committee in each school, in order to meet the educational variations in different localities.

It is the hope of the committee that the universities will make an extraordinary effort to agree on a general plan; deviation from it should only take place as a result of local conditions which cannot be immediately adjusted.

Four-year Course.

[The requirements for admission are graduation from a four-year high school, or the same as for admission to the freshman class of the College of Science, Literature, and the Arts, and should include one unit of General Chemistry. Manual Training is recommended.]

	First semester.			*Second semester.*		
FRESHMAN YEAR.	Credits.	Hrs.	½ days.	Credits.	Hrs.	½ days.
*Animal Biology, Nos. 1, 2, Gen. Zoölogy (*a*)	3	96	2	3	96	2
*Chemistry, Adv. Gen. and Qual., Nos. 3 and 4	3	96	2	3	96	2
*Rhetoric	3	48	1	3	48	1
*Technical Drawing, Nos. 21, 22 (*b*)	2	96	2	2	96	2
History, Economics, or Languages	3	48	1	3	48	1
Prosthetic Dentistry Technique	2	96	2	2	96	2
* (*a*) Botany, Nos. 1, 2, may be allowed as substitute.						
* (*b*) Physics, " 1, 2, " " " " "	16	480	10	16	480	10
[Students may be admitted to the Sophomore Year with 22 credits as a minimum, the remaining 6 credits to be made up prior to entering the Junior Class.]						
SOPHOMORE YEAR.						
Anatomy, Descriptive	3	96	2			
" Dissection				5	160	3
" Histology and Embryology				4	128	2
" Dental, Lectures	1	16		1	16	
" " Laboratory	2	96	2	1	48	1
*Bacteriology, General				3	96	2
*Chemistry, Organic	3	96	2			
Prosthetic Dentistry Technique and Practice	4	192	3	2	96	2
	13	496	9	16	544	10
JUNIOR YEAR.						
Crown and Bridge Technique and Practice	4	192	3	3	144	3
Dental Metallurgy	1	16				
Operative Dentistry Lectures	1	16		1	16	
" " Technique and Practice	4	192	3	4	192	3
Orthodontia Technique				2	96	2
*Pathology, General				3	96	2
" Special				1	16	
Physiology and Physiological Chemistry	5	160	3			
Prosthetic Dentistry Lectures	1	16		1	16	
" " Technique and Practice	2	96	2	1	48	1
	18	688	11	16	624	11
SENIOR YEAR.						
Crown and Bridge Lectures	1	16		1	16	
" " Practice	4	192	3	4	192	3
Materia Medica and Therapeutics	2	32		1	16	
Operative Dentistry Lectures	1	16		1	16	
" " Practice	4	192	3	5	240	4
Oral Surgery and Radiography Lectures	1	16		1	16	
" " " " Practice	1	48	1	1	48	1
Orthodontia Lectures	1	16		1	16	
" Practice	2	96	2	1	48	1
Prosthetic Practice	2	96	2	2	96	2
Theory and Practice of Dentistry and Conference Course in Applied Economics, Jurisprudence, Psychology, Ethics, and Art				1	16	
	19	720	11	19	720	11

One credit hour may be either one recitation hour through one semester, two laboratory hours with outside work, or three laboratory hours without outside work.

One semester = sixteen weeks; one week = forty-eight hours.

* See Appendix [next page] for description of courses.

APPENDIX.—*Numbers and descriptions of courses according to University of Minnesota Bulletins.*

General Zoölogy Nos. 1, 2. A survey of the animal kingdom, emphasizing the principles of structure, physiology, embryology, classification, and evolution of animals. Text-book, lectures, and quizzes.

Botany Nos. 1, 2. Laboratory study of the structure of flowering plants, their organs and tissues, followed by a brief study of common types of flowerless plants, leading to the origin of the flower and seed habit; greenhouse study of the behavior of plants; field work, classification of trees and shrubs and of spring flowers.

Advanced General Chemistry and Qualitative Analysis Nos. 3, 4. Lectures and laboratory work. A discussion of the general chemical theories and laws with qualitative analysis.

Composition and Rhetoric Nos. 1, 2. Practical training in the art of writing; the principles of structure and analysis of specimens of good prose.

Technical Drawing Nos. 21, 22. Theoretical and practical graphics, the reading and making of working plans. Projection, sketching, lettering, conventions, renderings and translations.

General Physics No. 1 (3 credits). Mechanics of solids and fluids, sound and heat. Treatment experimental rather than mathematical; the fundamental principles. First part of a general course. Should be taken in conjunction with Course 3, but may be taken separately.

General Physis No. 2 (3 credits). Light, electricity, and magnetism. Treatment experimental; the fundamental principles, including those of radio-activity, ionization, X-radiation, and the electrical constitution of matter. The second part of a general course in Physics. Should be taken in conjunction with Course 4, but may be taken separately.

General Bacteriology No. 58. A study of the biologic and chemical problems of bacterial life; the classification of bacteria; methods of isolation and culture; the composition of germicides, antiseptics, disinfectants, etc.; the bacterial examination of water and the purification of sewage.

Organic Chemistry No. 32. An outline of the chemistry of carbon, including the preparation of some of the more important organic compounds. Special emphasis is laid on those substances used in medicine.

General Pathology No. 51. The study of pathologic processes, including anemia, congestion, embolism, thrombosis, infarction, degeneration and necrosis, inflammation. Study of processes of regeneration and repair. Discussion of causation, classification, and history of tumors. Examination of tumor structure in various types.

In connection with the freshman-year program, we wish to emphasize that it allows the student to change from dentistry to other courses almost without waste of any kind.

The committee also recommends that the four-year course should be started in 1916, which was the time tentatively agreed upon at our last meeting.

Dr. KIRK, as a member of the committee, said he was in agreement with Dr. Owre's idea of preparatory training with a view to developing the highest intellectual efficiency, or what he had called "spiritual development," but he thought that this should not be incorporated in the dental curriculum. He was in full accord with the plan of adopting a four-year curriculum, but he felt that the additional year should provide for strictly technical and professional instruction in dentistry.

Dr. SMITH, as the third member of the committee, agreed with the plan of making the dental course four years, and also suggested that a plan be devised by which a man might be able to take both the medical and dental courses in, say, five years. He thought in this way many medical men might be attracted to dentistry, and that altogether it would make for a better educated class of men in dentistry. His plan was to have men enter the medical school as at present, and in the third year have the medical schools accept dental studies as elective toward the medical degree, and at the end of five years allow the man to graduate as an M.D. and D.D.S or D.M.D.

The report was on motion received and placed on file.

After further discussion of the subject by Drs. Owre, Kirk, Smith, and Koch, the association adjourned until the afternoon session.

SECOND SESSION.

The meeting was called to order at 2 o'clock by the president, Dr. Hoff.

The order of business for the afternoon session was the continuation of the discussion of the four-year curriculum.

Dr. PRINZ thought that the educational conditions in foreign countries were so different from ours that they could not be accepted as guides for this country. He also objected to the plan of carrying on education for dentistry in medical schools, and cited conditions in France and Austria where this plan was in force.

Dr. KENNERLY thought the question of adopting the four-year course should first be settled, and the curriculum decided upon afterward.

Dr. BREENE said the sentiment of his faculty was in favor of the four-year course, and when that was put in force they wanted to recommend one year in arts as a preliminary requirement. He thought, however, that the principal thing needed at this time was more time in which to teach dentistry, and he did not think that the proposed curriculum met this need.

Dr. SEMANS of the Ohio University Dental Department said the school with which he was connected was in full accord with the plan of making the dental curriculum four years, and that they proposed to put this into effect in 1916. He said also that his object in attending this meeting was to get information with regard to the feeling of the association on the matter of the four years' course, and to receive some moral support for the action his school was about to take.

Dr. HOFF read a letter to the Association from Dr. Moorehead, dean of the Dental Department of the University of Illinois, in which he advocated making the requirement for admission to the dental school one year in the college course, rather than increasing the dental course to four years. Dr. Hoff added that the sentiment of his school was the same as that expressed by Dr. Moorehead.

Dr. KIRK called attention to some of the subjects included in the proposed curriculum, and thought that these might more properly be incorporated in the entrance requirements, rather than to devote time in the dental course to teaching these subjects. He thought that more time should be afforded for the teaching of dental subjects pure and simple, and for this reason objected to the proposed curriculum as being an increase in time only, and that time devoted to teaching subjects which should not be included in the dental curriculum.

Dr. KOCH agreed with Dr. Kirk in regard to the subjects suggested, and thought they could be obtained in high school and should be made preliminary requirements instead of being taught in the dental school.

Dr. SMITH asked if Dr. Kirk would be willing to accept his plan with regard to the combination of the medical and dental courses.

Dr. KIRK objected to this plan for the reason that he did not think it advisable to put off too long the training of the manipulative skill of the student. As to the teaching of the medical subjects to dental and medical students together, he thought it best to teach anatomy, chemistry, and physiology especially to the dental students from the dental standpoint.

Dr. SMITH moved, and Dr. Breene seconded,

THAT we increase the length of the curriculum by one year, making it four academic years in length.

The motion was carried.

Dr. KIRK moved, and Dr. Smith seconded,

That this rule go into effect not later than the academic session for 1917–18.

Dr. OWRE said that he had sent copies of the proposed course to the different schools, and had found from correspondence that a majority of them were in favor of starting the course in 1917.

Dr. KOCH urged that whatever conclusion was reached at this time should be confirmed by the National Associa-

(Alternative) Four-year Course.

Freshman Year.

Subjects.	*Hours.* 1st Sem.	*Hours.* 2d Sem.	
Anatomy, General Descriptive		96	
" Dental, Lectures		16	
" " Laboratory		96	
Animal Biology No. 1, Gen. Zoölogy	96	96	
Chemistry, Adv. Gen. and Qual. 3 and 4	64	80	
Prosthetic Technique	144	48	
Rhetoric	48	48	
	352	480	Total 832

Sophomore Year.

Anatomy, Dissection	144		
" Histology and Embryology	96		
" Dental, Lectures	16		
" " Laboratory	48		
Bacteriology		80	
Chemistry, Organic	96		
Crown and Bridge Technique		96	
Operative Technique		96	
Physiology and Physiological Chemistry		144	
Prosthetic Dentistry Technique	48	96	
	448	512	Total 960

Junior Year.

Crown and Bridge Technique	96	96	
" " " Lectures	16	16	
" " " Practice		96	
Dental Metallurgy	16		
Materia Medica		32	
Operative Dentistry Lectures	16	16	
" " Technique	72		
" " Practice	72	144	
Orthodontia Lectures		16	
" Technique	144		
Pathology, General	80		
" Special		16	
Prosthetic Lectures	16	16	
" Practice		96	
Therapeutics		16	
Clinics		48	
Electives*		48	
	528	656	Total 1184

Senior Year.

Crown and Bridge Lectures	16	16	
" " " Practice	144	144	
Operative Dentistry Lectures	16	16	
" " Practice	192	192	
Oral Surgery Lectures	32	16	
" " Practice	48	48	
Orthodontia Lectures	16	16	
" Practice	72	72	
Prosthetic Practice	72	72	
Theory and Practice Conference		32	
Electives†			
	608	624	Total 1232
			Grand total 4208

* Psychology, Elementary Economics, Radiography, Odontology, etc.

† Students who are advanced in practice should be allowed to specialize in any part of the curriculum, especially in the second semester.

tion of Dental Examiners, and that they be urged to use their efforts to have this carried into effect in the statutes, and also that the action be confirmed by the National Dental Association, so that a declaration might be made on behalf of the profession.

Dr. KIRK agreed with Dr. Koch, and suggested that it would be well for each member of the association to use his individual influence in having this action and the action of the National Association of Dental Faculties backed up by statutory legislation throughout the different states.

Dr. COOKE said that the National Association of Dental Examiners at their recent session had passed a resolution favoring legislation for the four-year course.

Dr. Kirk's motion was then put and carried.

Dr. OWRE asked for an informal expression of opinion of the members of the association in regard to beginning the four-year course in 1916, and the following reported in favor: Pennsylvania, Iowa, Michigan, Minnesota, Dr. Koch for the Northwestern University, and Dr. Semans for the Ohio University.

The question of setting a date for the meeting to be held in San Francisco was taken up for discussion, and Dr. KIRK moved that when the association adjourn, it adjourn to meet at the call of the Executive Committee. [Motion carried.]

The association then adjourned until Thursday morning at 9.30 o'clock.

THIRD SESSION.

The meeting was called to order Thursday morning at 9.30 o'clock by the president, Dr. Hoff.

Dr. COOKE presented the following resolution:

MOVED, That we ask the medical schools connected with the universities represented to arrange and adopt a curriculum by which the degrees in medicine and dentistry may be earned at the end of a five years' course.

The resolution was discussed by Drs. Owre, Kirk, Smith, Cooke, Miner, after which Dr. KIRK moved, and Dr. Owre seconded, that the resolution be adopted.

Dr. COOKE explained that this resolution did not interfere with any other plan suggested, but was simply offered as one method of training men in dentistry.

Dr. OWRE moved that the four-year curriculum be adopted as proposed by the Educational Committee [see p. 553], with such readjustments as are found necessary in each institution.

The motion was seconded by Dr. Kirk.

Dr. KENNERLY suggested that another meeting of the association be held early in the spring of 1916, and that each member of the association work out a curriculum following as nearly this plan as possible, and that final adjustments be made at that time.

Dr. KIRK thought that all of those subjects not strictly dental should be eliminated from the curriculum.

Dr. OWRE then presented as an alternative curriculum, one containing strictly dental subjects—the curriculum outlined at the previous meeting. [See opposite page.]

The motion was further discussed by Drs. Smith, Prinz, Hoff, Cooke, and Kennerly, after which the motion was carried.

Dr. KENNERLY then moved that the dean of each school be requested to forward to the Educational Committee an exhibit of the proposed curriculum which his institution proposes to put into practical effect, so that the Educational Committee may compare the various suggestions and tabulate the differences and agreements, and report to the association at the next meeting.

The motion was seconded by Dr. Kirk and carried.

It was the sense of the association that a meeting should be held in January 1916.

Dr. HOFF then declared the meeting adjourned subject to the call of the Executive Committee.

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

Regular Monthly Meeting, held January 26, 1915.

THE regular monthly meeting of the Academy of Stomatology was called to order on Tuesday evening, January 26, 1915, at eight o'clock, by the president, Dr. J. C. Curry.

The essayist of the evening, Mr. ARTHUR HOPEWELL-SMITH, Philadelphia, was introduced by the president, and read a paper entitled "Problems of Pain and Other Oral Sensations."

[This paper is printed in full at page 494 of the present issue of the COSMOS.]

Discussion.

DR. OTTO E. INGLIS. There are some points in this valuable paper the explanation of which did not seem to convey to my mind convincing proof of the *modus operandi* of the production of pain in some of the cases described, and I would be glad if Mr. Hopewell-Smith, in closing the discussion, would elucidate these a little more. In discussing the sensitivity of enamel, the essayist spoke of the differentiation by the teeth of semi-soft substances taken between the teeth, such as shot, or still softer substances such as the crust of bread, and hard substances such as pins. It does not seem, unless the enamel has a certain degree of sensitivity, that it would be possible for it to differentiate these. So far as I have been instructed in this matter, it seems that all such tactile sensitivity is practically referable to the pericemental tissue. It has been claimed that, while the pulp can feel pain, it is devoid of real tactile sense; it does not locate its own pain, and such sensations as we feel about the teeth, due to contact with their exterior, are localized by the pericementum, which, judging at least from clinical experience, seems to have a sense of touch. In several cases which I have observed myself the enamel was unquestionably sensitive, and in view of the enamel spindles shown in the essayist's illustrations and the demonstrated fact that the dentinal fibrils extend into the enamel, any sensitivity of the enamel is in all probability due to these sensitive fibrils being touched.

As regards "setting the teeth on edge," the essayist's explanation did not seem to be very clear. Our knowledge of the process of dental caries and Williams' demonstration of the effect of hydrochloric acid on thinly beveled enamel specimens seem to offer a sufficient explanation for the phenomenon of setting the teeth on edge. I think the essayist gave this explanation himself when he spoke of "sour grapes." I am sure that acids or substances of decided acidity when taken into the mouth dissolve a certain portion of the interprismatic cement substance of the enamel, and as a result the enamel rods remain higher than the cement substance, so that a somewhat serrated surface, microscopically minute, is present on occluding teeth, and the rasping of such teeth over each other produces the phenomenon of gritting. This unevenness is quickly worn down, and the teeth again become smooth.

A propos of the galvanic shock induced by a dental mirror touching a filling, I would like to relate a little incident. On one occason I placed a filling in a lower right third molar, and a few days later the patient reported that she had not the slightest sensation upon mastication or upon applying heat or cold, that she could touch the filling with a pin or fork without producing

pain, but that a little tin mirror of about two inches in diameter, when placed against that tooth, would produce a shock. I told the patient that on one occasion a man came to Dr. Garretson's clinic and said, "Doctor, when I move my arm into any of the ordinary positions, I do not have any pain, but when I raise it high above my head, I feel pain." Dr. Garretson said, "What in the devil do you do it for?"

Dr. G. C. Kusel. I have listened to the essayist with a great deal of interest. In connection with the illustration of thrombi occurring in the pulp, the thought occurred to me that possibly here might be an early manifestation of what is known as arterio-sclerosis, and I would like to know if the essayist has associated these conditions, and at about what age these thrombi occur.

I would like also to have him explain to us why we have more sensation in gingival cavities than in cavities in other portions of the tooth. We find so often that of two cavities requiring preparation in a tooth, the one at the gingival portion is more sensitive than the one at another portion of the tooth.

In illustrating the referring of a sensation by the brain to another portion of the body, the essayist said that, when a foot or arm is amputated, the brain constantly refers sensations of pain to the amputated limb. This may be explained by the fact that the center for conveying sensations to the brain from that region had developed as the person developed. The brain, if the impression be referred from the ideo-motor center to the automatic center for the member in question, very naturally recognizes the lost member, because it is by reason of the existence of these centers that we are cognizant of the possession of such limbs, although not entirely so; hence the loss of such limbs does not mean the loss of function in either of these centers. It is our visual and tactile impulses associated with reasoning that cause us to recognize their absence or presence, and not the centers in the brain connected directly by nerve fibers. When members have been lost, as in intra-uterine amputations, these centers do not develop, and in such cases there can be no subconscious references. Possibly the brain is not so much at fault after all.

Dr. Hewitt. Referring to Dr. Inglis' suggestion that the interprismatic substance is dissolved and causes the teeth to be set on edge, I would say that this does not explain the instances where the teeth are set on edge from placing the hand on soft velvet or similar substances.

Dr. Gaskill. One question came to my mind when the essayist said that the sensation of pain, when eating a fig, is purely mental; that there is no actual pain in the teeth themselves, but that it is referred to the teeth as a purely reflex sensation. I cannot reconcile myself to that statement. It seems that there must be some irritation in the tooth, because we know there is a stimulus to the nerve terminals from the sugar of figs and some other dried fruits, which is very active at times. Moreover, these nerve terminals of the teeth are more susceptible at some times than at others; so there must be some actual local manifestation in the nerve terminals in the teeth, rather than in the soft tissues as stated by the essayist.

Mr. Hopewell-Smith (closing the discussion). The question of the sensitivity of the teeth is very difficult to answer in anything like a satisfactory manner. Some believe that sensations in the teeth are due to osmosis in the dentinal tubules, but that is pure hypothesis, and it is difficult to explain or account for sensations in this way. I cannot myself conceive of dentin acting as an osmotic membrane. No one knows much about it.

In reply to Dr. Inglis' remarks in regard to the sensitivity of enamel, I gather that he considers that, when a tooth detects the presence of such things as crumbs of bread, the sensation must be referred to the periodontal membrane. If that be true, this tissue must be frightfully sensitive.

Dr. Inglis. Would that not be a matter of education, or perhaps some

mental idea as to how shock would feel in the teeth?

Mr. Hopewell-Smith. Memory and experience may come in as important factors; but I am now speaking more from the histological point of view. If we knew more about the nerve supply of the periodontal membrane, we might be able to speak more definitely.

In regard to the phenomenon of setting the teeth on edge, I do not think there is any dissolution of the enamel. As Dr. Hewitt suggested, that explanation does not account for the sensation when touching soft velvet and other similar objects.

Dr. Inglis. Does that set the teeth on edge?

Mr. Hopewell-Smith. Surely.

Dr. Inglis. Is it not that the person grits the teeth because of a nervous impression?

Mr. Hopewell-Smith. I think they do that on account of the pain felt in the teeth. I am sure that is the case with myself.

One of the speakers asked if arteriosclerosis was present in the patients from whom these specimens were taken. As a matter of fact I do not know, but it never struck me that there were any general sclerotic changes. I do not think that the patients from whom these teeth were extracted were at all susceptible to those changes, because these specimens were taken in the regulation department of the Royal Dental Hospital of London from patients whose ages varied from eight to twelve years. There may be sclerosis there, but I did not investigate that point. We know that degenerative changes in the teeth are seen in early life, but I do not think that in the cases I examined there were any constitutional causes for thrombosis.

Dr. Kusel asked why teeth were more sensitive at the gingival than at other portions of the tooth. The reason for that is the closer proximity of the gingival portion to the pulp, and the shorter distance which a sensation has to travel from there than from the periphery of the tooth. Dr. Gaskill suggested in regard to the pain induced by a fig that I might have been mistaken, and that there may have been a cavity in a tooth. I do not believe that was the case, because I know that my teeth were all right. Then again, if that had been so, I should have felt the sensation of pain several times, whereas it occurred only once, and since that time, years ago, I have had the same experience perhaps twice only. If it had been from local dental causes, the pain would have occurred every time I ate a fig or took sugar of a similar character.

Dr. Mershon. I think the Academy appreciates fully the valuable paper which Mr. Hopewell-Smith has presented to us, and I move that a vote of thanks be extended to him for his paper. (Motion carried.)

The society then adjourned.

NATIONAL DENTAL ASSOCIATION—SOUTHERN BRANCH.

Sixteenth annual meeting of the Southern Branch of the National Dental Association, and the forty-seventh annual meeting of the Georgia State Dental Society, held at Atlanta, Ga., June 4, 5, and 6, 1914.

(Continued from page 453.)

FRIDAY—*Morning Session.*

The next order of business was the reading of a paper by Dr. H. W. MORGAN, Nashville, Tenn., entitled "Dental Education," as follows:

Dental Education.

By H. W. MORGAN, M.D., D.D.S., Nashville, Tenn.

What is education? has and always will be a live topic. Yet at the risk of being considered an "educational bore," I shall, at the outset, try to point out what education is not. Quoting from a recent paper: "First of all, it may be said that education is not on the part of the subject the mere acquisition of knowledge, or on the part of the educator the mere impartation of knowledge." We are told by Mr. Huxley, who wrote upon this subject nearly fifty years ago, that "In the newly awakened zeal for education, we run some risk of forgetting the truth that, while under-instruction is a bad thing, over-instruction may possibly be a worse. Success in any kind of practical life is not dependent solely or indeed chiefly upon knowledge." For, to quote Mr. Huxley again, "The great end of life is not knowledge, but action. What men need is, as much knowledge as they can assimilate and organize into a basis of action; to give them more of it may become injurious. One knows people who are as heavy and stupid from undigested learning as others are from overeating of meat and drink." An oriental proverb has expressed the same idea:

Who learns and learns, but acts not what he knows,
Is one who plows and plows, but never sows.

Of course the acquisition of knowledge is essential to education, but not its prime object, though it is in this limited sense most commonly used. Educators of today insist that education aims not at mere knowledge or mere power, but at knowledge and power put to right uses. They define education as "any effort to assist the development of an immature human being toward the proper goal of life."

THE PRIME OBJECT OF ALL EDUCATION.

The prime object, then, of education is power, ability to cope better with men and things, to become more efficient in the great struggle for existence. True education increases the student's strength to grasp, to hold, to utilize—especially to utilize. Practical ability to meet issues, to solve difficult problems, is the test of power. It does not matter how much you know, how much theory you have stored up in your mind; if you cannot marshal your knowledge at will and concentrate it upon the weak place, you are an impractical man. You must make every bit of your knowledge practical, or it will not avail you when the trial comes.

That man is educated who is trained in his perceptive faculties, in his analytical powers; so trained in all his abilities that, when surrounded by difficulties, he will be able to see where he is, able to understand what the occasion

demands, and able to master his conditions instead of being overwhelmed by them. The man overcome by his condition is not educated. Useless knowledge, then, is not education. Practical, live, comprehensive command of one's abilities and the full development of one's native resources constitute true education.

We make a serious mistake when we limit our efforts to professional training. Our duty to society is not, therefore, fully discharged when that obligation is met. Education means the development of the person, the training of the affections and the will into an earnest and loving desire to move in harmony with the laws of nature. Learning is not wisdom nor vital energy nor a substitute for common sense. Colton says, "It is better to have wisdom without learning than learning without wisdom." A student may have a head full of facts, and come out of school almost as weak as when he entered. He may rank high, and yet not have half the power of the slow, lazy boy, who ranks low.

A college course is called, by courtesy, "an education." A college course is not an education, it is only the beginning of an education. It is the foundation—and it should be a *good* foundation—for the student to build on for the rest of his life, and he should be taught that the superstructure will be determined solely by his own application and abilities.

A college course cannot do more than touch upon the rudiments of the science of dentistry, and the student cannot too soon learn that college training merely prepares him to study intelligently. A diploma does not stand for a great deal of learning; after all, it only certifies that the holder has taken a stipulated course of study in the college which gave it.

The dental degree stands pre-eminently above all others in that its possession is evidence of practical work satisfactorily done, and the claim that a dental graduate is better prepared to begin the active duties of his professional life than the graduate of any other profession is based upon this important fact. When a young man goes into dentistry, he must fight his way up step by step, each beset by all manner of temptation, petty jealousies and evil influences, which discourage and retard his progress. It is the college course that has furnished the theoretical knowledge of the principles, the practical training, the moral strength, the cultural equipment, and the friendships. I cannot too emphatically insist that no amount of knowledge and discipline will avail a man if he is not moral and honest.

DENTAL SCHOOLS' FACULTIES.

After these observations, we come now to the practical part of this paper. We are living in a scientific age, and with the increase of science relating to our profession has come the multiplication of instructors and subjects taught until the faculties list of some of our American dental schools looks like a young city directory.

There are eleven hundred and thirty names in forty-three college announcements, according to the last report of the American Institute of Dental Teachers. One school is put down as having nine as the lowest; two have fifty-eight, one sixty-six, one sixty-nine, and another eighty-eight. This may be meeting the demand for higher education, but the element of personal contact, if not entirely eliminated, is so remote that it is inappreciable.

The writer does not take these lists seriously to mean that these institutions use all these men in giving instruction, but would protest against the use in school catalogs of the names of men not called on for services. It is a padding process that educational ethics should not tolerate. Professional schools should live up to the standard of ethical conduct which they hope will govern their graduates.

INADEQUATE ANNUAL NUMBER OF DENTAL LICENTIATES.

The conviction seems to be growing that dental schools, notwithstanding

their splendid success and increasing progress, are not educating enough men to recruit the ranks of the profession. It is estimated that there is a five per cent. loss each year on account of death and retirement; that about two thousand licenses should be granted each year to fill up the ranks. This allows nothing for the increase in population nor the increased demands for dental service. In 1913 twenty-one hundred students were graduated; of these but thirteen hundred and fifty, according to the report of the National Association of Dental Examiners, were licensed.

The proper recruiting of the profession is a matter of great moment to the public, and to boards of examiners as well as to dental schools. The public is demanding more and more dental service each year. The care of the state's dependents, the unfortunate inmates of penitentiaries, insane asylums, institutions for the feeble-minded, is a call to humanity that is going to do much to impress the necessity for dental services upon the public mind, and will, in the near future, tax the profession to its utmost, and it is the joint duty of these boards and schools to be ready to meet the call when it comes. In our efforts to "elevate the profession" let us not forget that the public has an interest that must be recognized. Let us acknowledge our responsibility by encouraging young men to prepare themselves for this service.

Every dentist should feel equally this duty, earnestly warn young men of the fatal mistake of entering upon this great work without the proper equipment, and urge the great need of well-trained men and their thorough preparation before entering the profession. Such a course will strengthen the efforts of the educator and make the duties of the state boards less difficult.

THE QUESTION OF ADEQUATE COMPENSATION. DENTAL SCHOLARSHIPS URGED.

There is another aspect of this question of professional education in regard to which dentists have not yet realized their obligation. This is a financial one. Education is the only thing which I know is still sold for less than it costs. We may raise an adequate supply of young men, we may improve our teaching faculties, we may inspire young men with the ambition necessary, but men must live while they are being educated. Many struggle for their preparation but to find a dental education beyond hope of attainment. There is never a year that numerous cases of this kind do not apply for assistance. The dental profession should be willing to make a liberal offering to aid in developing worthy young men for their chosen life-work. Scores of men within the sound of my voice know worthy young individuals who would go into dentistry today, to become bright ornaments to the profession, if this financial obstacle were not in their way. Many of them will come, but not until they are advanced in years, and are handicapped by the taking up late in life a work which requires supple, young fingers, as being the quickest in mastering a difficult and complex technique.

Financial aid in the form of "tuition scholarships" and "loan funds" have proved very beneficial in our academies, colleges, and universities. The University of Pennsylvania in 1906 assisted students to the amount of $4244; Harvard had 260 scholarships ranging from $60 to $400 each. I have been teaching thirty-five years, and during all that time but one man has ever asked me if any dental student ever needed financial assistance. I do not believe the student who earns his way through school can get the best out of it. A few do earn their way, but they are not the leaders. There is an obligation here. May I ask, Will the dental profession ever meet it?

Discussion.

Dr. Homer C. Brown, Columbus, Ohio. The essayist has very ably presented a vital subject. Education, in its broadest sense, is the development of the individual mentally, morally, and

physically, to the end that he may be more efficient, and contribute his services to mankind in a manner that will be worth while.

Education is only secondary to health. In my opinion the question of the physical man is one for first consideration, since it would not profit him in the fullest measure to be educated to the highest possible degree, if he had no physical constitution to apply that education. The college course, as Dr. Morgan has so ably said, should be only the foundation for future education, and no graduate should accept his diploma from a dental or any other college, except as a credential for further study and greater usefulness. I was very much impressed with the essayist's statement regarding the forty-three dental colleges which carry a list of 1130 names of professors, instructors, special lecturers, etc., and to note the very great difference of from nine in one to eighty-eight in another institution. I do not know whether both these institutions maintain membership in the same organization or not, but if so, there certainly is an opportunity for the criticism of the one or the other of these colleges, or of the organization in which they hold membership. If nine men are sufficient to teach the dental student all that he should be required to know, eighty-eight is entirely too large a number, and there naturally will be more or less confusion resulting therefrom. I am inclined to think that nine is entirely too small a number, and that eighty-eight would probably be getting into each others' way some time during the college year.

Dr. Morgan appeals to the dental colleges to practice more ethics in their faculties, their catalogs, and their curricula, and I commend him for the stand which he has taken with reference thereto. Recently I addressed a letter to the dean of each dental college in our country, inclosing a circular letter addressed to the 1914 graduating class, and requested that these deans present this appeal and supplement it with such suggestions as they thought proper in order to stimulate the young men coming into the profession at this time to an increased interest in our dental organizations in the various sections of the country, to the end that we may secure their co-operation in everything that means progress in dentistry. I am of the opinion that if the practitioner of dentistry needs the assistance of our various organizations at any period in his life, he needs it in the first few years of his practice. This is becoming recognized more and more, and the tendency of men to wait until they feel able to attend meetings, join societies, etc., is most reprehensible.

The fact that twenty-one hundred persons were graduated from our dental colleges in 1913, but only 1350 were licensed by the various state boards, is most remarkable. There are examining boards in practically every state in our country, and if such a high percentage of graduates are unable to pass the various examining boards, it would seem that the students are not fully equipped when they graduate, or possibly that the requirements are too strict in some states.

Dr. Morgan. May I interrupt just a moment, to say that Dr. Brown's conclusion is not exactly correct? Many of the 2100 graduates were foreign students, and did not have to apply for license, while many others had degrees before they went to the colleges; that will account for some, but not for all, by any means.

Dr. Brown. I thank the essayist for this suggestion.

Dr. Morgan emphasizes the necessity for an increased number of dentists. I am fully aware that a shortage of dental practitioners, if it does not already exist, will soon exist, and this is another phase worthy of most careful consideration. On the other hand, I wish to emphasize the essayist's statement that the dental student should be more thoroughly equipped in regard to preliminary education. The greatest regret of my professional life has been that my preliminary education was so limited that every step of progress I have made

has only been accomplished under a positive handicap.

The essayist referred to the question of finances, so important to the dental student, and presented some figures that are more or less appalling. I can see the advantage of the establishment of scholarships, and think this should be encouraged wherever possible. I can appreciate, from my own personal experience, under what handicap a student is placed by lack of financial means.

Dr. J. P. Corley, Sewanee, Tenn. Unfortunately I did not hear this paper by my stepfather in dentistry, but Dr. Brown's discussion suggested a thought in reference to the appalling number of dental students who fail to pass the state board examinations. What is there left for them to do? It occurs to me that the dental college might incorporate in their curriculum a course in public dental education and prophylaxis, and require that their students should become efficient in the presentation of illustrated lectures on this subject, using the faculty and the student body as their audience upon whom to practice. Then if a man failed to pass the state board examination there would be a tremendous field left open to him, one ten times greater, and, if you will allow me to say it, of one hundred times greater importance than if he were commissioned to practice and do technical work for suffering humanity. It seems to me that this would afford the colleges an opportunity to use material which otherwise they could not use. There are young men who cannot qualify technically to save aching molars, but who might prove to be geniuses in the field of platform work, and who by lecturing before the thirty millions of public school children in the United States would be instrumental in saving hundreds of thousands of first molars. There is no law so far against a man speaking in public schools on prophylaxis; probably the time will come when we will have licensed men to do that, but at present the field is open. So instead of paying money for a dental equipment, the student might buy a lantern and lantern slides.

Gentlemen, this is not a dream. I realize that I am open to the criticism of having been a dreamer all my days, but this is practical common sense, and it seems to me a not unreasonable request to make of the dental colleges of the United States.

While I am on my feet, I want to pay tribute to the dental teachers of this country. If there is any class of men in dentistry that humanity should take off its hat to, it is the dental teachers. I know what they have sacrificed in order to do their work. I know what it costs them to give their best ability and best thought to the education of young men who may succeed them.

Dr. H. H. Johnson, Macon, Ga. The essayist's paper has already been thoroughly discussed from every standpoint. The subject of dental education is a very broad and interesting one. We all have our individual views along these lines. With the essayist, I believe in practical and scientific education. He struck the keynote when he said that little education is not much worse than over-education. I believe there can be too much schooling, too much training. The times and conditions are changing; new sciences are evolving; the world is broadening, new fields are being discovered, and no human mind can grasp them all. This is an age of specialism, and any man who perfects himself in one specialty during his lifetime has done well. The man who tries to master all science only gets a smattering of many subjects, and not enough of any one to be of practical value. When a patient presents in a dental office he wants to know whether the dentist can give the service required, whether he has perfected himself in that specialty, even to the exclusion of other broadening sciences. I believe in practical specialism, practical knowledge, practical education toward the occupation which a man has selected for his life-work.

Dr. B. Holly Smith, Baltimore. Taken in its broad sense, education is

never complete, but there is a growing appreciation of its value on the part of those who have passed the meridian of life and have given sober judgment to the facts. Schopenhauer says something like this: "In our infancy or early life, we look forward to great events as approaching us in a military parade with brass bands; but when we have gone over the hill, we look back and see that the really great things that come into our lives, come in by the side door, unheralded, quietly." And so it is with education. It has been my observation that the training of youths in colleges and schools has not consisted merely in the acquisition of knowledge, but of such training and mental equipment as enabled the student to think and to act better on any question. Like my distinguished friend, Dr. Brown, I can make a personal comparison between my opportunities and the opportunities which I had the privilege of extending to my own children by giving them the chance to see the disadvantage of the uncultured mind and the great advantage of a thorough education. It is not that one remembers Henry VIII, the Greek roots, or the Latin synonyms of English words, but that one's mind has been so trained that it enables him to meet a problem face to face and to judge it fairly. It is to such training that we owe the achievements of the great men of our profession.

Dr. Morgan (closing the discussion). I wish to express my hearty thanks to the gentlemen who have so kindly discussed my paper. I wish to emphasize that there is no such thing as the perfectly educated man; there never was and never will be, in my opinion. As I have pointed out, college education is simply the training of the heart and mind of the man to put forth the best that there is in him, and the superstructure depends entirely upon his application. Dr. Brown emphasized the idea of physical training. The old Greeks spent just one-half as much time in the gymnasium as they did in the schoolroom, and they were right. I wish every institution in this country had a system of physical examination before permitting students to enter. I believe the time will come when men who go to dental schools will be examined physically with as much care as applicants for entrance into the navy or the army. Then we shall practice true eugenics. We shall have material to work upon, and shall begin to develop it in the grammar schools. We shall then have the desired physical culture, and produce a race of people superior to the ancient Greeks.

Motion was then made and carried to adjourn until the evening session.

Friday—*Evening Session.*

The first order of business for the evening session was a lantern lecture by Dr. Carroll H. Frink, Jacksonville, Fla., on "Surgery of the Mouth, Teeth and Jaws," illustrated with models, drawings, etc.

The next order of business was the reading of a paper by Dr. T. P. Hinman, Atlanta, Ga., entitled, "Modern Crown and Bridge Construction."

[This paper is printed in full at page 491 of the present issue of the Cosmos.]

Discussion.

Dr. H. H. Johnson, Macon, Ga. Dr. Hinman has presented to us a most excellent paper. He has advanced an idea that I believe to be entirely original and extremely valuable. I refer to his suggestion that receding gums may be caused by the hammering of food particles against the dental ligament during mastication, due to improperly constructed crowns. If we stop to think a moment of the anatomy of the tooth, we know that at the rounded termination of the enamel at the neck of the tooth there is a folding of the gum under this sheltering ledge, giving protection to the ligamentous attachment at that point. Despite our knowledge of this anatomic condition, we have failed to reproduce it in our artificial work.

The essayist's method of producing cusps in gold crowns by casting is entirely correct, and I see no reason why we should still resort to the clumsy technique for obtaining correct occlusion that we have had to pursue in years past, when we can so simplify it by molding the cusps in wax, taking the occlusion in the mouth, investing and casting, thus making a complete crown in one operation. I believe, however, that 30 gage gold is too thin for bands in molar crowns, and in many instances for bicuspid crowns, especially if we intend to attach bridges with these crowns as abutments. I have seen that demonstrated many times, when the band, not being able to bear the strain of mastication, was torn away, and the bridge had to be removed for extensive repairs. I believe that 28-gage would be better in those cases. The profession has become so economical, however, that it is difficult to procure 28-gage gold plate, as the supply houses keep only 30-gage. It is poor economy to weaken the bridge foundation in order to save ten cents' worth of gold.

I differ with Dr. Hinman in regard to the size of the pin in his method of making a Richmond crown. I believe that 16-gage wire is too small. For laterals 15-gage would be better, and even 14-gage in canines and other large teeth. Dr. Hinman spoke of the form of crowns and bridges on the lingual and palatal sides, eliminating the so-called self-cleansing spaces. Evans in his "Crown and Bridge Work" calls attention to this idea. Time has demonstrated that saddle bridge work, if properly fitted and held rigidly in place by substantial abutments, may be cemented in place, even if it covers a considerable area of gum tissue, which will remain healthy for years.

Twenty years or more ago, Dr. E. Parmly Brown of New York made porcelain bridge work on this principle, resting on platinum saddles, and it was successful. I have seen porcelain bridge work constructed by Dr. Brown, the saddle covering a square inch of the gum surface, which was cemented in place, the gum having remained in a sanitary condition for years.

A townsman in 1895 applied to me for a piece of anterior bridge work, consisting of four incisors which were to be attached to canines. There was a great deal of resorption of the gums and process, and the constructing of a bridge after the methods in use at that time would have meant an unsightly piece of work, with considerable projection of the teeth. The patient's attention was called to this. Knowing the difficulties and objections, I made for him a little plate instead. I could restore the lost gum tissue with plate work, but it could not be done with the bridge work in use at that time. When on a visit to New York, the patient consulted Dr. Brown, who made a platinum saddle covering an inch of the gum surface, baked on four teeth, including a portion of pink gum, the bridge being fastened in the canines with platinum pins held in place by gold fillings, the whole appliance constituting a beautiful piece of work. On his return, the patient showed me this bridge, which I, in good faith, condemned as not being sanitary. To my utter surprise, the patient wore the appliance for years. I saw it constantly, as he came to have other work done. The gum remained perfectly healthy, and the condition sanitary so far as I could judge. That convinced me at that time that saddle bridge work could be successfully made. We are now perfecting those ideas which were started so long ago. These methods did not seem reasonable, and we took hold of them with fear and doubt, but now we confidently cement bridges in the mouth with large saddles resting over the ridge of gum. If fitted properly, such bridges are sanitary, hence the bridge work of the future will be more efficient, more correct anatomically, and more lifelike and healthful.

Dr. W. E. Lambright, Atlanta, Ga. I wish to ask Dr. Hinman a few questions. In regard to shell crowns, does a shell crown cause more recession than the modified Morrison crown? Again, does the essayist believe in using coarse

disks to round off the corners of teeth which are being prepared for the reception of crowns? How many sprues are used in casting a crown with platinum base?

Further, I would like to thank Dr. Johnson for his remarks about saddle bridge work. I have been experimenting quite a good deal in that direction, and I was pleased to hear his comment.

Dr. R. C. Young, Anniston, Ala. I would like to say that the two worst curses that ever came to the dental profession are the rubber plate and the gold crown. I do not know of anything except the extracting forceps that is more abused than the shell crown. The practitioner who puts a gold shell crown on a tooth without previous devitalization is almost guilty of malpractice. I know that this statement will be strongly resented, but that is my honest opinion.

The question has been raised as to whether it is better to use a Morrison or a Richmond crown. It has been my misfortune to see a number of good healthy roots split by the use of the Morrison crown, and I do not think that the Morrison crown has any place in restorative dentistry. On the other hand, we realize that a certain amount of recession of the gum is due to the use of a band. Platinum, however, seems to have the property of preventing this recession of the gum, as has been stated by Dr. Hinman. We have had today a most beautiful illustration of the usefulness of porcelain as a restorative means in dentistry, and I cannot conceive why it is that porcelain is not more universally used. But I want to reiterate that, if there is one curse in dentistry, it is the contemptible abuse of the gold shell crown.

Dr. H. H. Johnson. I would like to reply to Dr. Young in regard to his statement that it is malpractice to place a gold crown upon a tooth without devitalizing the pulp. I believe I have made crowns and bridges for as long a period of time as any practitioner in Georgia; in fact, I believe I can prove that I made the first bridge that was ever made in Georgia. I do not advocate the devitalization of all teeth which are to be crowned with gold crowns, and I have the following good reasons therefor. A patient presents to me for a piece of bridge work; he has one molar and some front teeth serviceable as anchorages. This molar is not devitalized. A crown is placed over the molar, the frontal abutments are prepared, and the bridge is cemented in place. Cement is not invulnerable, and in time dissolves from under the molar crown. The patient begins to feel a sensitivity at that point, and returns for examination. The bridge is removed, repaired, re-cemented in place, and is as good as ever. If the molar has been devitalized before placing the gold crown on it, the telegraph wires are destroyed which give the patient protection. If the tooth is devitalized, and the cement dissolves, as in the example described, the patient is not aware of it, and it is a matter of common knowledge that a tooth under a loose crown decays four times as fast as one under ordinary conditions. The patient after a time returns saying that the bridge has become loose in the rear, which immediately informs the experienced bridge worker that upon removing the bridge he will find a piece of soft cartilaginous substance which now represents what was once a good tooth. That was the last tooth the patient had on that side, probably his last means of mastication, and its loss to him is beyond estimate. Had that tooth not been devitalized, the bridge and the molar might have lasted ten years or more longer. Even if it had been necessary to devitalize it at the beginning of the second period, it would have rendered a long period of service afterward. There are cases, of course, where considerable grinding is to be done, and the teeth become so sensitive that, in order to prepare the abutments properly, the teeth have to be devitalized, but to advocate the devitalization of every tooth to be crowned is malpractice, in my opinion.

Dr. J. G. Reid, Marion, N. C. I fully agree with Dr. Johnson. I have

constructed bridges that have been in the mouth for fifteen years, and the abutment teeth are still vital. I think every practitioner who is not a crank on the subject of devitalizing teeth knows that no root-canal filling is as good as the natural pulp. One of our best bridge workers in North Carolina said that unless we devitalized the pulps in all teeth to be crowned, we were doing criminal work; his brother, who is a very good operator and is associated with him, told me that he does not devitalize any teeth unless he has to.

Dr. YOUNG. I am surprised that a man of Dr. Johnson's technical ability could put forward such a lame proposition as to say that he wants the sensitiveness of the teeth to act as a warning signal to tell him when bridge work fails. Dr. Johnson is a magnificent workman, but such men as Rhein of New York have spent years in order to demonstrate the fact that the insertion of a gold crown upon a vital tooth causes a degeneration in the pulp which has no apparent outward manifestation, but will make its impress on some vital portion of the body. We have been told that infections from such sources have resulted in endocarditis, abscesses in the liver, kidney trouble, and hosts of other dangerous lesions. The sooner we realize that fact the sooner we shall become better therapeutists. By overcoming this all-absorbing mechanical trend of the profession, we shall hasten its progress. Excuse me from the man who is solely mechanical. We must combine science and mechanics for the best good. And when we substitute a lost tooth with a bridge, let us make it by no means a menace to life and health. I defy any practitioner to crown a tooth by cutting away sufficient tooth structure for a perfect adaptation of a shell crown, and not have the pulp undergo degenerative changes.

Dr. JOHNSON. I agree with Dr. Young in regard to the statement that the gold crown has been a curse. I know that it has been abused, and that the profession has suffered for that; but that is not the question we are discussing. I know Dr. Rhein personally and am familiar with his manner of operating, and while he may at times have discovered pulp stones in teeth that had been crowned, I have seen the same in teeth which have not been crowned. I have seen just as many pathological conditions in teeth that had been filled as Dr. Young and Dr. Rhein have seen under crowns, and I do not attach so much importance to these so-called discoveries. Of course, when an operator makes an ill-fitting crown, we may be sure that trouble will follow, no matter whether the tooth is devitalized or not.

Dr. YOUNG. This is a question of vital importance. We know, Dr. Johnson, that you are a magnificent operator, and that you are not guessing, but how are we to present this problem to the student?

Dr. JOHNSON. Let us discard the ill-fitting crown. You will admit that it is impossible to construct a gold crown with a band fitted so well that the gold will touch every surface of the tooth?

Dr. YOUNG. Yes.

Dr. JOHNSON. You will admit that there is a considerable film of cement between the gold crown and the tooth?

Dr. YOUNG. Yes.

Dr. JOHNSON. Then your contention and Dr. Rhein's contention that the contact of metal causes the trouble is disproved.

Dr. YOUNG. It is the cement, not the metal. I believe that glacial phosphoric acid will kill any pulp.

Dr. JOHNSON. I am glad you make that contention, because it strengthens my position. You admit, then, that after the tooth is crowned, even if it has been accurately shaped for the reception of a gold crown, you have not approached the pulp as near at any point as you would in a carious cavity of medium depth. Your contention is that cement is absolutely unfit as a filling material for any tooth, because it is closer to the pulp than when used for cementing a crown in position. I suppose you have never capped a pulp?

Dr. YOUNG. Never, except with arsenic.

Dr. Holland. What do you line cavities with?

Dr. Young. That is a different proposition from the trimming of a tooth for a crown, robbing it of that marvelous substance of nature, enamel, which is not found in any other portion of the body. No other part has such a protection by an absolutely inert compound as the enamel rods afford, and when you scale this off and replace it with glacial phosphoric acid in sufficient amount to set a crown, you will cause disturbances in the tooth. As to lining cavities or capping pulps with cement, if this material is placed in a tooth *close* to the pulp, we might just as well place arsenic in the tooth, because sooner or later the tooth is going to die. That is the point, and I do not retract one iota.

Dr. Johnson. What do you fasten gold inlays with?

Dr. Young. Cement.

Dr. Johnson. Then you subject the tooth to the same possibility of trouble from the contact of phosphoric acid with dentin and at a nearer approach to the pulp, and your contention as to the gold crown is inconsistent.

Dr. Young. That is not a comparison.

Dr. Hinman (closing the discussion). I shall try to take up the points at issue *seriatim,* and discuss them as briefly as possible.

Dr. Johnson prefers 15 or 14 gage wire for pins instead of 16 gage, which I use more than any other. In some cases it would probably be better to use 14 or even 12 gage wire, but, as a general rule, the 16 gage wire seems to be satisfactory.

Dr. Lambright asks if I find more recession due to shell crown than to a Morrison or disk crown. A shell crown causes no more recession if its construction is correct than a pin-and-disk crown. The reason why gold crowns cause so much recession is that they are incorrectly shaped. The reason for so much recession from the ordinary pin-and-disk crown is that, in restoring the lingual surface, it is made concave instead of concavo-convex. I believe that the pin-and-disk crown, if properly contoured and adjusted, has all the strength requisite for an individual crown, but not for a bridge abutment. As for the Richmond crown, if the technique I spoke of is followed, and the root surfaces are restored in metal, no recession will ensue.

The question of degenerative changes in the pulp underneath a crown has caused much discussion. It is a demonstrable fact that, as soon as a tooth is filled with any material whatever, a degenerative process will take place in the pulp, no matter how small the filling be. This physical fact is easily demonstrable. The matter of putting a crown over a vital pulp is a question of individual judgment. Of course trouble may be caused by cutting the tooth down too far, and, as I said, whenever the pulp is approached too closely, it is a safe plan to devitalize the tooth and fill the roots. That, however, is a matter of individual judgment and technique. A great many vital teeth have been crowned with gold, and have given no trouble for many years; but it is also true that in a great many teeth which have been crowned with gold, the pulps have died. Therefore we have to use judgment in each individual case. In controversion of what Dr. Young has said about cutting off the enamel and replacing it with an artificial substitute, my experience has been that a shell crown or porcelain jacket crown does not cause any more disturbance in the pulp than a metal crown. It is not the grinding-off of the enamel covering, nor the fact that we place cement under the crown that causes the pulp to die. It is true that degenerative changes occur, and that the pulp begins to protect itself, but the real reason why the pulp dies lies in the fact that, when we grind the tooth down, the mouth being filled with germs, the tubuli of the teeth become filled with these germs, which pass through the tubules into the pulp, causing infection and death of the pulp. The way to overcome this is to wash the tooth thoroughly with alcohol before the crown is set.

There are several methods for cutting down hypersensitive dentin. We have

nitrous oxid and oxygen analgesia, for which I do not care—and I will diverge here for a moment to say that I believe this to be one of the crazy waves that come over the profession now and then, and soon pass off. Analgesia may have its place in the hands of some operators, but it has no place with me. I am not condemning it entirely, but am simply giving my views in regard to it. With the use of novocain injected properly by the Fischer method, I can extirpate the pulp of or cut down any tooth painlessly.

I hope you have all had an opportunity to see and criticize the work I have passed around; I wish you to notice one or two items particularly, namely, that the lingual, buccal, and labial surfaces are anatomically correct; also that the saddles are very small. The technique of making these saddles I did not have time to describe in detail.

The next order of business was a talk by Mr. F. O. Foster, Atlanta, Ga., on "New Appliances and Improved Methods During the Past Year."

Motion was then made and carried to adjourn until the Saturday morning session.

Saturday—*Morning Session.*

The meeting was called to order on Saturday morning, June 6th, by the president, Dr. Dean.

The first item on the program for the morning session was the reading of a paper by Dr. B. Holly Smith, Baltimore, Md., entitled "The Responsibility of the Members of the Dental Profession to Those Who are Without Opportunity for Dental Treatment."

[This paper is printed in full at page 534 of the present issue of the Cosmos.]

Discussion.

Dr. Homer C. Brown, Columbus, Ohio. In beginning the discussion of this paper I will say that as a member of the dental profession I fully appreciate the many sacrifices which the essayist has made along the lines indicated in his paper. I referred yesterday to the pioneers in dentistry, and what they have accomplished. Dr. Smith has been one of these pioneers. I personally know of sacrifices which he has made in his home city in order to develop an interest in dental matters among school boards, among medical men, and among the laity, and I wish to take this opportunity of expressing my high appreciation of the men of his caliber for the sacrifices which they make in order to put our profession on a higher plane.

Some are fortunate in the possession of wealth; some are called to positions of honor and influence; some are blessed with a surplus of energy and time, and some are qualified to formulate plans and execute progressive policies for the good of the masses. And he who gives of his purse, his influence, his energy, his time, with a view to improving the present or future generations, is generously contributing to a worthy cause, and his closing days will be brighter for his having rendered some real service for the uplift of humanity.

In doing such work as the essayist has presented in his paper, we are receiving increased support from the medical profession, from educational interests, from philanthropic and from civic organizations, such as we could not have hoped for five years ago. This support has been rendered possible by the work of the pioneers to whom I have referred. I am grateful for the privilege of being present this morning, and thus enabled to call attention to the opportunity which confronts the profession in Georgia at this particular time, as indicated in Dr. Huff's report with reference to the public health bill pending in the legislature of the state. I think it is very important that the profession of your state give loyal support to this bill, and that you impress upon the members of the legislature the advantages to be derived by your co-operation, thus not only securing the enactment of this bill, but enforcing it.

First, we must recognize that the individual is a unit of society; second, that society can be divided into two classes,

producers and non-producers; third, that the progress of a municipality, state, or nation depends primarily upon maintaining a high percentage of productive units; fourth, that health is the first essential in establishing and maintaining a high productive standard; fifth, that by healthy children taking advantage of the liberal educational opportunities, and later the favorable vocational conditions, such as exist in our country, we are justified in assuming that the percentage of productive units can be increased, and that such means should be employed as may be necessary to accomplish this end. If our state and municipal authorities are going to force education upon us—and we certainly know that they are not doing this any too soon—it is just as important for them to keep a child in fit physical condition to receive this education as it is to expend money in educating the child. When this question is properly appreciated, school and municipal authorities will look to the individual for efficiency, and whatever means are necessary to equip the child for highest efficiency in its future life should be employed. In considering the item of expense the public should understand that such increased expense as would naturally be caused by the maintenance of free dental clinics for the indigent is amply offset by what it costs to keep "repeaters" in school an additional year.

Dr. Frank Holland, Atlanta, Ga. I do not feel equal to discussing a paper like the one we have just heard. The essayist has set forth many truths that appeal to us all, one of his strongest arguments being unselfishness. The unselfish man is he who accomplishes things in this world, who does things for the benefit of his fellow man. It devolves upon us to make up our minds to apply as fast as we can the truths which the essayist has set forth. If you show me an unselfish dentist, I will show you a successful one, who is a benefit not only to his *clientèle* but to his profession as well, and who will make himself felt in his community as a valuable citizen. If you show me a selfish dentist who looks upon the sordid dollar as the only object worth seeking, I will show you one whose accomplishments have been so meager that he is never thought of, and who, after all, has accomplished nothing for himself except the few dollars he may have accumulated.

Dr. H. H. Johnson, Macon, Ga. I appreciate very much the honor of being called upon to discuss this admirable paper, but hardly know where to begin. I heartily agree with Dr. Holland that selfishness is the root of all evil. We always admire those characters in history who have devoted and sacrificed their lives for the good of mankind and for science. We have recorded in the history of Atlanta the life of a man who practiced dentistry here, Dr. J. B. Bean, whose career evokes our admiration. Dr. Bean, during the civil war, devoted his services as best he could to hospital work in the Confederate army. Afterward he was called by the government to make some investigations in Switzerland, and in pursuing his investigations among the snow-capped mountains in unexplored regions, he was lost, and realized that he must die from starvation and cold. Immediately on discovering that he was freezing, that life must end, he took from his pocket a tablet and pencil, and until the cold palsied his hand wrote down the sensations of a person dying from cold, so that this description might go down as a contribution to science. It is this kind of character that we admire. The beautiful sentiments expressed in the paper animate not only other noble lives, but the essayist's own.

Dr. N. A. Teague, Augusta, Ga. We cannot but admire the men enumerated by Dr. Smith in his paper who gave their lives for science. What a difference between the lives of these men and the sordid life of the man who is working for the dollar only! I do not feel capable of discussing this admirable paper, but wish to express my sincere appreciation. It is worth a trip to Atlanta to have heard the essayist's beautiful sentiments.

Dr. J. P. Corley, Sewanee, Tenn. I do not wish to discuss the paper, because I am not qualified to do it justice. This

essay deals with fundamentals. In the mind of the great Architect who built this universe there were thoughts which the human mind, up to the present time, has not been able to comprehend. The paper shows that there are two diametrically opposed forces, for which we cannot account. On the one hand we have love, unselfishness, devotion to principle and self-sacrifice, and on the other their antitheses. I believe the unselfish devotee of idealism has in many instances sacrificed and ruthlessly wasted his efforts, and died before his time. Since we are developing in every domain of civilization logical plans for efficiency, why not consider the question of philanthropy in dentistry. Instead of one individual sacrificing himself, scattering his forces and making a wreck of his finances on the one side, while another individual meets with but indifferent success, why not let us evolve a scientific plan like other philanthropic organizations, and employ a trained expert in this line. Then the dentist could, out of his meager funds, contribute to the support of such an expert, and his earnings would yield greater dividends, and he would not have to sacrifice himself. Some of my best friends —and Dr. Smith is one—are killing themselves for their fellow men. Can we not conserve our forces? We have with us an expert who is available for just this work, and I would like to ask that the courtesy of the floor be extended to Mr. Jones, who for twenty-five years has been a salaried specialist in advancing philanthropic enterprises throughout the country.

Mr. M. Jermain Jones, Washington, D. C. This is my first attendance upon a convention of dentists. It was my pleasure to travel with the essayist from Washington, to become acquainted with him. to read his paper, and to feel the magic of his message of altruism and learn his interpretation of what we may call the new social spirit in America. It is not inane flattery when I say that the personal touch with you men from Tennessee, Texas, Florida, South Carolina, Georgia and Atlanta, has convinced me of the high sense of responsibility, of unselfishness, of what I may call social conscience that exists in your body, and of your desire to give expression to this idealism in some practical form. This, gentlemen, is the age of the social question; it is the age of transition from the selfish to the social ideal of life. That spirit is being shown in a thousand ways and I need not dwell upon it, as Dr. Smith has beautifully portrayed it in the examples set before us this morning. But I do want to say that your essayist's interpretation of the dentist's duty toward humanity, of his attitude as a citizen in the community, as a factor in society, is but one more evidence of the conscience that is stirring men and women of our time with the obligation of altruism. We talk about conscience. Is there such a thing as conscience for self? What is conscience, if not an expression of one's obligation, not with a view merely to one's self, but with a view to his relation to others? I was struck, as I listened to the essayist, with the story of altruism expressed by the lives of these men. You are asking the question, "What shall we do?" "How shall this beautiful ideal which our essayist has spoken about so feelingly be attained?" The question which you are bound to solve is, how you may in your community do what has been done in Baltimore, in Rochester, in Cleveland, Detroit, Cincinnati, and other cities. I have been a student of the social question and have been practicing in this field of social engineering a good many years. I have felt the impact of this question, and I have been giving my life for a good many years to the service of the Young Men's Christian Association. I know of no other field of education that I should prefer to devote myself to than social service. Somehow or other there has come to me the opportunity to join hands with the organization which was created as an auxiliary by the National Dental Association four years ago, known as the National Mouth Hygiene Association. That organization has its headquarters at present in Cleveland, and will probably have other headquarters in Washington. With the co-operation which

Dr. Smith has outlined as ideal, and the practical results which in many communities have already been attained by the counsel and direction of men interested in this movement, by organized publicity, by a lecture bureau, and other feasible means, we hope that we may not be content until we shall have reached the byways and highways of our country with this campaign for school clinics.

Mr. President, the question you are asking is—What shall we do? The question which Dr. Smith raised of how the ideal may be made practical, how the uplift of humanity may be realized, that question we hope we shall be able to help you to answer.

Dr. H. W. Morgan, Nashville, Tenn. It may seem bold to attempt to add to the most interesting discussion we have heard, to say nothing of the essayist's beautiful prose poem, but this great work which Dr. Smith has so forcefully outlined is one which is strongly impressed upon us at this time—"the brotherhood of man and the fatherhood of God." The essayist asks, "Am I my brother's keeper?" and proceeds to point out how not only individuals but legislative bodies are providing for protection of human life, and are endeavoring by various movements to enlist the sympathies of everyone in the misfortunes of the masses. During the year ending in July 1913, a commission in charge of the factory operatives in the state of Massachusetts reported no less than eighty-four thousand accidents in the various manufactories in that state. All the efforts toward the introduction of machinery that would protect human life did not avail to prevent these numerous accidents. The world's attention toward the conservation of life is nowhere more beautifully illustrated than in the great work done by the Rockefeller Foundation toward the eradication of the hookworm. I want to suggest to the members of the National Mouth Hygiene Association that Dr. Wycliffe Rose, who is at the head of that work, would surely be able to offer most valuable suggestions for working out the plan which the National Mouth Hygiene Association has in hand. While not a doctor of medicine, this educator was called to that work, and notwithstanding the great opposition which it met with in the beginning, the work has been so effectively and successfully carried on that thousands and thousands of lives have been saved from the enervation and lethargy incident to that disease. He is now, I believe, abroad making a canvass of the entire world, for the hookworm is not a local condition in the South, as it was believed when that great Methodist divine raised his voice against it, and presented his objections through your Atlanta papers a few years ago. We are heading in the right direction. The Forsyth brothers in Boston and Dr. Julius Rosenthal in Chicago have done what we as a profession could not do, and state after state will fall into line, until the time will come, I believe, when the poor unfortunates who have no knowledge of their conditions, the inmates of our insane asylums, our penitentiaries, etc., will be provided with sufficient dental service to meet their great needs. I mentioned yesterday several instances in two states where this has already been accomplished, and let me say that these appointments have not been made owing to any pressure exerted by the dental profession, but through the interest of a few medical men who have been aroused to the importance of this work. As soon as we are able to convince the physicians of the importance of mouth hygiene, the necessary state aid will follow as a matter of course.

I congratulate Dr. Smith and the association upon his most magnificent presentation. He says that it is self-sacrifice that counts; that our lives are worth nothing, that we leave nothing behind us, unless we render services to our fellow men. The great Agassiz, when asked why he did not, instead of devoting himself to natural history, devote himself to medicine or some other calling, that he might make for himself a fortune, said, "I have no time to think about making money."

Dr. Smith (closing the discussion). It is very difficult, because of my warm

affection for those who have been so complimentary in their comments, to avoid in closing this discussion some thought of loving appreciation for the compliments that have been tendered me. But in our efforts for the advancement of our profession and the increase of our usefulness within that profession, selfish considerations, even of warm appreciation or commendation, must be eliminated. As a body of professional men we should keep ourselves in the background, while we establish in the minds of all whom we can reach the value of such a propaganda of dental education as shall bring home to the common people, who have hitherto regarded our services as out of their reach, the absolute importance and necessity of dental attention.

That so much self-sacrificing effort has been made by the members of our profession for the extension of this propaganda of oral hygiene is most commendable, and the results have been truly remarkable. In the last few years we have achieved recognition of the necessity of our work from large corporations, manufactories, from the navy and army, to say nothing of our great sister profession, medicine. Indeed, in my home city the leaders of that profession will not attempt treatment without previous examination of the mouth and its proper treatment. This growth in general esteem is most gratifying, especially to those of us whose memory carries them back to early and very different conditions. We have labored early and late to reach our present status, and the reward is the consciousness that we have projected our service into fields which really did not invite them, but in which our helpfulness has been appreciated after our visit.

I cannot take my seat without recalling some of the incidents that have occurred in the various foregatherings of the distinguished men who have carried on the activities of this Southern Branch of the National Dental Association. I cannot feel with equanimity that this is the last meeting of this association. The deepest sentiment of loving appreciation fills me when I think of the opportunities that have been afforded me for commingling with the great men who have made this association useful in its work for the profession and for the community. I recall the characters, often unique, often picturesque, of the men who have stood as leaders in the thought and action of the Southern Association. I wish that you gentlemen who are members of this association had not taken action toward its disbanding. It seems to me that the sacred memory of the activities of this professional organization, the thought of the men who have come in and out of our meeting, leaving their impress not only upon us individually but upon professional thought generally, should have withheld such a decision. Out of respect to these memories it seems to me that it would have been better to have the association reconvene at the call of the Executive Committee. I have never approved of killing, in fact I have killed very few people or things in my life, and I am not at all in the frame of mind to commit suicide. I loathe death, and I wish earnestly that we might rescind the action taken, and at least allow this association to remain in a state of suspended animation. There may occur a time when we might want to reconvene; there may be some celebration or some anniversary, some occasion when we would want the members to reassemble. I have talked with some of the members who voted for the disbanding of the Southern Branch of the National, however, and I acquiesce in their judgment.

I do not want to project my own views on the thought of this body, but I do wish there could be some way by which we could so modify the action taken that the present Executive Committee would have the privilege of calling together this association if, as I say, a special occasion warranted the call.

Mr. Chairman, I want to thank you for the courtesy extended, and my loving friends for their kind words of appreciation.

(To be continued.)

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Devoted to the Interests of the Profession.

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EDITORIAL DEPARTMENT.

THE FOUR YEARS' CURRICULUM.

AFTER years of agitation and the educative effect of experience, which have fully demonstrated the inadequacy of the standard three years' curriculum as preparation for dental practice, the sentiment of the dental profession in America seems to be ready to support an increase in the time of the dental curriculum to four years. Indeed, the National Dental Association, the National Association of Dental Examiners, the National Association of Dental Faculties, and the Dental Faculties Association of American Universities, have each and all officially committed themselves by resolution as favorable to the advanced standard.

Dental educators have for years felt that the three years' curriculum was overcrowded to a degree which made efficient teaching in all of the required subjects of the curriculum almost impossible. Boards of examiners who have had to pass upon the products of our educational system under the three years' standard

have complained of the insufficient preparation of candidates—all of which, with the steadily increasing data which make up the sum total of dental knowledge required for successful practice, has combined to make the demand for additional time in preparation for dental practice imperative.

In anticipation of the official increase in time of the dental course, much attention has been given to the consideration of the manner in which the added time should be utilized, and a variety of suggestions to that end have been made, among the most striking of which are suggestions which have been variously proposed for the incorporation in the new curriculum of cultural studies such as languages, rhetoric, history, economics, psychology, ethics, the principles of art, public speaking, freehand drawing, and the like. These suggestions have been made not only in good faith, but in clear recognition of an existing cultural need in the average dental student. No one can successfully question for a moment the immense value and utility of these cultural subjects as part of the education of the dentist, and it is doubtless because so many dental students are defective in the culture which these studies are believed to develop, and do develop when they are faithfully and intelligently pursued, that dental educators, realizing the intellectual deficiency which lack of training in these subjects entails, have proposed to remedy the defect by incorporating them into the dental curriculum. We are in sympathetic agreement with those who realize the need of proper cultural development of the dental student, but we are wholly opposed to the means suggested for obtaining that kind of cultural training. The only logical way to obtain it is to demand proficiency in the group of subjects referred to as a part of the entrance qualification required for admission to the dental course.

In one of the proposed curricula published in this issue, forty-eight hours are given to materia medica and therapeutics, while to anatomy and its subdivisions are assigned a total of four hundred and forty-eight hours in this arrangement of time. Not only is undue emphasis given to anatomical and histologic study out of all relative proportion to its importance in the dental curriculum, but on the other hand, materia medica and therapeutics, which should involve adequate training in pharmacology, is minimized to a degree which would render the education of the dental stu-

dent in that subject well-nigh worthless. Similarly, ninety-six hours are assigned to general bacteriology, with no provision for the special bacteriology of the mouth and its relations to mouth infections and systemic diseases. It is doubtless valuable and important for a dentist to know something if not all about the bacterial examination of water and the purification of sewage, but it is more important for him to know a great deal about the microbiology of the mouth and the bearings of that subject upon the question of local and systemic disease. It is questionable whether in sixteen hours a student can secure more than a superficial smattering of dental metallurgy, and it is equally questionable whether in one hundred and fifty hours of combined lectures, laboratory, and practice he can secure more than a superficial smattering of orthodontia.

These instances are referred to for the purpose of pointing out the necessity not only for a complete readjustment of the details of the standard dental curriculum, but to emphasize the fact that in the readjustment it is of fundamental importance that the content, the extent, and the systematic grading of the course should be done with an eye single to the creation of intelligent and efficient practitioners of dentistry. With that object as the goal of dental education clearly in mind, the question of what constitutes the intelligent and successful practice of dentistry becomes the underlying factor of the whole educational scheme. It must be manifest to everyone who has kept in touch with the progress of dental and medical thought that the problems which today call for solution as presented by the *clientèle* of the average dentist are wholly different to those which confronted the profession less than a quarter of a century ago, and that they imperatively demand, in order to meet them, a correspondingly adapted type of dental practitioner. The immense possibilities which have been opened up, the recognition of the importance of mouth hygiene, the relation of oral infections to the bodily health, the nervous relations of defects in the dental mechanism, all present problems for solution which did not confront the earlier practitioners of dentistry, because the existence of such relations was then undreamed-of; in consequence of which dentistry developed almost wholly as a mechanical art, and the system of education related to dentistry was until recently almost wholly technical and manipulative in its ideals.

While no less emphasis should be placed upon that aspect of

our educational work, it is undeniable that the point of dental attack upon the problem of disease has completely changed in the light of the developments of modern bacterio-pathology, neurology, and internal medicine; and in order that the future practitioner may hope to cope successfully with the health conditions involved within his sphere of practice, it is necessary that the time which is soon to be added to the standard dental curriculum shall be utilized for the more thorough training of students in the medical sciences that have direct application to his needs as a practitioner. This does not necessarily mean that we must import into the dental curriculum more of medicine, but it does mean that we shall more efficiently and broadly teach those phases of medical science which are directly applicable to our needs.

For example, the subjects of anatomy, physiology, and pathology, as ordinarily taught in the standard medical course, need to be so modified in their presentation with respect to the needs of the dental practitioner that he may be able to learn intensively those things which shall be of most use to him in his practice, and extensively those things that are of relatively minor importance. Our literature teems with enthusiastic statements of the "wonderful progress of dentistry"; it teems almost as much with expressions of the desire for "recognition," particularly recognition by the medical profession. With the opportunity for enlargement of the standard dental curriculum now confronting us, there is danger that we may fail to "progress" toward the goal of highest efficiency in the service of the community as dental practitioners, and because of our desire for "recognition" by the medical profession may overdo the arrangement of the new curriculum upon the medical side, by importing into it not simply that quantity and kind of medical science most useful and necessary for our needs, but that which has been found essential or desirable in the training of the medical practitioner. Our safety lies in a recognition of the soundness of the inquiry formulated years ago by Herbert Spencer, "What knowledge is of most worth?"—and the knowledge of most worth to the practitioner of dentistry is the kind which develops his highest efficiency in the service of the public within the range of activities that he is called upon to fulfil.

Bibliographical.

The Principles and Practice of Tooth Extraction and Local Anesthesia of the Maxillæ. By William J. Lederer, D.D.S., Dental Consultant to German Hospital, City of New York. Illustrated with 120 textual figures and 8 figures on 4 plates. New York: The Rebman Company. Price $3.00.

This little book of two hundred and sixty-two pages is divided into three sections, the first consisting of forty-one pages dealing with the general question of infections following dental operations, asepsis and sterilization, the relation of the operator toward his patient, examination and preparation of the patient, indications for tooth extraction, the armamentarium, and a classification of cases. The following eighty-four pages are devoted to a description of the technique of tooth extraction in normal and abnormal cases, post-operative pain, hemorrhage, and the treatment of complications attending tooth extraction. In the second part of the work one hundred and five pages are assigned to an exposition of local anesthesia, and twenty-seven pages, forming the concluding portion of the work, are allotted to useful formulæ and prescriptions, poisons and their antidotes, the treatment of emergencies, a glossary of terms, and the index.

The general impression which one gathers from an examination of the book is that of its thoroughly practical character and the soundness of its teaching. We know of no work which within such brief compass gives more practical information in regard to the subject of which it treats. On the other hand, the evident effort of the author to avoid verbosity and the undesirable fault of overloading his book with material of questionable usefulness has, we think, led him too far in the opposite direction, and has produced a work which would be improved by greater particularity in the treatment of a considerable number of subjects which have been given only brief consideration.

It is also somewhat surprising that in a work of this character no consideration whatever is given to the subject of general anesthesia in connection with the operation of tooth extraction other than to define what general anesthesia is, and to state that "Local anesthesia has displaced general anesthesia to a large extent in dental and oral operations." In view of the tremendous extent to which general anesthesia by nitrous oxid has been used in tooth-extraction operations, and considering the fact that it is still extensively used in that connection, a work on the subject of tooth extraction is necessarily incomplete without an exposition of that well-established and still popular method of inducing anesthesia.

A large number of the illustrations in the book are wholly diagrammatic, and while they are confessedly such, we are almost tempted to say that they are wholly bad as diagrams. Figs. 29, 32, 45, 58, 66, 74, 75, and 79 are examples

of diagrammatic representations that are defective in that their solution compels a "scientific use of the imagination" presumably greater than that possessed by those ignorant of the subject, for whose special benefit it is assumed that the work was written. With the exception of the reproductions of direct photographs or radiographs, the illustrations are not up to modern standards in works of this class. As a specimen of book manufacturing the work is capable of improvement, and in the judgment of the reviewer, for its size and character it is overpriced. The book is so nearly a good thing of its kind that we trust a future edition may correct some of the deficiencies which mar the present one and detract in no small degree from its otherwise practical usefulness.

NOTES ON DENTAL SURGERY AND PATHOLOGY. By T. W. WIDDOWSON, Licentiate in Dental Surgery, Royal College of Surgeons, Eng.; late House Dental Surgeon Liverpool Dental Hospital, etc. With over 150 illustrations. Interleaved with blank pages for the reader's own notes and drawings. London: John Bale, Sons & Danielsson, Ltd. 1914.

The title—which includes the statement that it is "intended as a ready work of reference for the busy practitioner and a note-book for students"—clearly sets forth the scope and purpose of the work. It is a compilation of brief notes covering the whole range of dental surgery and pathology in a fairly exhaustive manner which should find a large sphere of usefulness as a reference work both for the student and for the practitioner, covering the essential features of the subject within its scope. No elaboration of description is attempted. The volume should be useful also to the student preparing for examination either in course or for licensure.

The interleaved feature of the book is a convenience that will be appreciated by the student who desires to make additions of his own in further elaboration of the work or to record later developments of the subjects treated.

The author makes little or no claim to originality for the matter presented, but acknowledges the "valuable help" which he has obtained from a number of standard text-books and treatises. Conspicuous by its absence from the references acknowledged is the "American Text-book of Operative Dentistry," from which practically all of the section dealing with the subject of tooth discoloration is taken, although credit is given by the compiler to Marshall's "Operative Dentistry" as one of his sources, which may account for the omission of credit to the "American Text-book of Operative Dentistry," for the reason that the section in Marshall's "Operative Dentistry" dealing with tooth discoloration is taken almost bodily from the "American Text-book of Operative Dentistry," and the author of the present work may not have been aware of its origin.

The illustrations are for the most part original drawings and mainly diagrammatic. We have no objection to offer against the use of diagrammatic drawings in their proper sphere of usefulness, but it should be constantly borne in mind, to paraphrase a statement of Emerson's, that it is the virtue of an illustration to illustrate just as it is the virtue of a pipe to be hollow, and a number, in fact too large a number, of the so-called illustrations in this work do not illustrate. Fig. 11, which is stated to

be "a dilacerated tooth," is as a matter of fact not an illustration of a dilacerated tooth at all, but a tooth with a crooked root with the dilaceration left out. The hypoplastic teeth in Figs. 15, 16, and 17 represent the likeness of nothing so far as we know in the heavens above, the earth beneath, or the waters under the earth. Fig. 33, of the *spirochæta pallida,* looks like a sphygmographic tracing. Fig. 36 is said to be "the tobacco-pipe appearance of Tomes." It is well that it is so designated, for without the inscription it might be readily mistaken for an elastic abdominal supporter. Fig. 41, a molar showing arrested decay and hypoplasia is open to the same objection that we have noted with reference to Figs. 15, 16, and 17.

The defective character of these original diagrammatic illustrations detracts decidedly from their teaching value. It is not a question of artistic criticism, but of their pedagogic uselessness, to which attention is directed. An illustration which is misleading pedagogically is not only without justification, but is open to serious condemnation. The teaching value of this book—which means its helpfulness to the student—would be greatly enhanced if the compiler would replace the so-called illustrations of the class referred to by photographic half-tone reproductions. A drawing at its best can convey no more than the artist himself has seen; the photograph correctly reproduces the object, or at least with such an approach to perfection that all parties at interest become original observers in relation to it, and are not compelled to accept a secondhand observation through the interpretation of the artist or draftsman. On the whole the book is a valuable one, but for reasons herein stated we wish that in a future edition it might be relieved of the incubus of defective illustrations that now mar its usefulness, and for which defect responsibility rests upon the publisher rather than upon the author.

The Doctor His Book of Poems. By Frank P. Davis, M.D., Enid, Okla. 1914. The Publisher and Author: Price $1.00.

"A posy of other men's flowers bound together with a thread of his own choosing" is the compiler's apology for issuance of this interesting collection. Attempts to gather together collections of this sort are made from time to time, and while they often present themselves in more pretentious form and dress, we have seen none which represents a happier selection, none which, on the whole, more fully justifies its existence, or which, between the lines, more clearly sets forth the genial sense of good humor of the compiler himself. Every reader will feel a sense of gratitude to the compiler for the pleasure derived from the reading of this collection of verse.

REVIEW OF CURRENT DENTAL LITERATURE.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Deutsche Zahnärztliche Wochenschrift*, Berlin, December 19, 1914.]

IMPROVEMENT IN REPLANTATION. By Zahnarzt Mayer, Mainz.

Replanted teeth frequently become loose after some time owing to absorption of the apical root portion, and fall out, even though they may have remained firm for years. To prevent this absorption, Mayer provides a supply of small caps of soft 22-k. gold of from 2 to 3 mm. in height and of various widths, to which a fine pin of from 5 to 6 mm. length is soldered, which serves to retain the cap in place and as a partial root-canal filling. The method of application is as follows: After thoroughly cleaning the socket and removing all diseased portions of the root, the root-canal is enlarged from the apical foramen to allow insertion of the gold pin. A cap of suitable size is selected, and cemented firmly over the root, and its margins are burnished. In this way not only the large apical foramen, but also its accessory canaliculi are hermetically sealed-off against contact with the surrounding tissue, thus preventing the establishment of osteoclasts at the root-apex, and subsequent absorption. The writer has applied this method in three cases of replantation, the teeth becoming firm. Time alone will tell, of course, whether the osteoclasts may not find their way below the cap and start their destructive action, though this fear has not been confirmed by radiographs. Moreover, osteoclasts are found usually only in portions denuded of pericementum, hence it is important not to destroy this tissue before replanting a tooth. The writer fails to describe his method of filling the major portion of the root-canal in teeth to be replanted, which must, of course, be done by means of a permanent root-canal filling material, preferably gutta-percha or paraffin, or a combination of these.

[*Therapeutic Gazette*, Philadelphia, February 15, 1915.]

THE JAWS, THE TEETH, AND THE GENERAL PRACTITIONER. Editorial.

Joining the campaign against oral sepsis which within recent years has aroused so much interest and has done a great deal toward stimulating the co-operation of the medical and dental professions, the *Therapeutic Gazette* remarks editorially:

The time has long passed when the general practitioner had no interest in the condition of the jaws and teeth of his patient, save that occasionally he was called upon to remove a troublesome molar. With the advance of our knowledge concerning the causes of many diseases, and with our constantly increasing information as to the means by which bacteria find their way into the tissues of the body, we are now on the outlook for septic foci, and in a very large proportion of cases find them about the teeth, in the form of a pyorrhea alveolaris, and sometimes in the tonsils. From these two centers of infection, microorganisms gain access to the circulation or to the lymph channels, and, being carried to other parts of the body, induce arthritis, infections of the kidney and bladder, of the endocardium, and sometimes of the pleura. Recently we have seen several cases in which the presence of pus about the roots of the teeth has resulted in serious and prolonged illness, with all the manifestations of septicemia.

Not only may general systemic infection arise from these causes, but the swallowing of germ-laden saliva or food so contaminated results in an infectious catarrh of the stomach and intestines, and possibly induces inflammatory changes in the mucous membrane of the common bile duct and finally of the gall bladder. It is of vital importance, therefore, that in investigating an obscure case of fever

and arthritis the condition of the oral cavity be carefully looked into, that the dental surgeon shall be called in consultation to discover and remove the foci of infection, and that the expert radiographer shall also be asked to aid in the discovery of a possible cause of illness, since it not infrequently happens that by this means a septic focus at the root of a tooth is discovered.

Under these circumstances the tooth should be removed, or its surrounding tissues so treated that, with the aid of antiseptic applications, free drainage may be obtained. Careful oral hygiene and the use of a suitable mouth-wash should be instituted. It not infrequently happens that septic foci about the teeth produce no general or local symptoms until by some illness or other cause the patient's vital resistance becomes impaired, and then the micro-organisms which have been lurking about the roots of the teeth are able to induce severe illness.

[*La Stomatologia*, Milan, No. 9, 1914.]

THE ENAMEL CUTICLE. HISTOLOGICAL AND HISTOGENETIC RESEARCHES. By Prof. Dr. Arturo Beretta, Bologna.

In a series of painstaking articles, which have since appeared in form of a book containing 75 beautiful photomicrographs and 25 interesting tables, the writer has delved into the hitherto fairly neglected problem of the enamel cuticle, arriving at the following results: The enamel cuticle—Nasmyth's membrane—is a cuticular formation which envelops the coronary portion of the normal adult tooth, remaining there throughout life. The most appropriate name for this tissue, in the light of our present knowledge of dental histogenesis, is "enamel cuticle;" other terms which have from time to time been suggested are inaccurate, misleading, or without significance. The cuticle originates from the transformation of the epithelial cells which compose the primitive pericoronary epithelial envelope after the secretion of the prism is completed. More exactly, it results from the transformation of the ameloblastic layer into the basal membrane, and from that of the other upper ameloblastic epithelia of the epithelial envelope into areas of granular consistence which, owing to their origin, may be called "cuticular epithelial remnants," this origin being the same as that of other epithelia, which though originally belonging to the enamel organ, afterward remain inclosed in the maxilla. The processes of transformation take place in a different manner in different teeth, according to the various points of local nutrition in the same tooth and the primitive morphological structure, in the order of the different pressures to which the various parts of the epithelial pericoronary envelope are subjected during the advance of the erupting tooth. The time elapsing between the complete formation of the enamel —viz, when, the function of the ameloblasts being completed, the transformation of the elements of the pericoronary epithelial envelope into the enamel cuticle begins—and the eruption of the tooth is not the same for all teeth, and probably differs even in individuals of one and the same species, this variation depending upon local as well as general conditions. Hence it is impossible to determine exactly the condition of the cuticle at the moment of eruption, this condition varying for the reasons mentioned in different teeth even of the same animal. It is therefore possible in some teeth, generally the molars, to find the enamel cuticle fully developed as a formation in which epithelial elements are no longer discernible. In other teeth, such as the incisors, the cuticle exhibits multiple epithelial masses more or less clearly preserved or in various phases of transformation. It is correct, therefore, to assert like Von Brunn that the enamel cuticle is found in teeth which are about to erupt even though they have not yet made their appearance above the gum; also that it is found in portions where the enamel is completely formed, and that it is completely wanting in those teeth where the enamel formation is not yet completed at any point. The cuticle remains throughout life in animals up to senile age. With the advance of age, if the cuticle is isolated by decalcification due to acids, this formation is found to be of greater thickness than in previous stages of development. This apparent increase in thickness is due to the action of the acid, which simultaneously with the cuticle dissolves a small superficial layer of fully formed enamel which adheres to the true cuticle, from which it can easily be differentiated by histological examination.

[*Deutsche Zahnaerztliche Wochenschrift*, Berlin, February 20, 1915.]

NEW APPLICATION OF BAKED PORCELAIN FILLINGS AND PORCELAIN RODS. By Dr. B. Dirks, Würzburg.

Dirks recommends the employment of a porcelain rod or pluglet to be inserted in the root-canal instead of a metal pivot. The root-canal is enlarged with a bur of the same size as the porcelain rod, according to Guttmann's system as described in Dental Cosmos, April 1911, p. 488. To prevent any lateral or rotary movement of the finished all-porcelain crown, any enamel on the lingual surface protruding above the gingival line and not entirely denuded of sound dentin is left standing, and shaped up so as to give additional support to the crown. The crown portion of the porcelain rod is allowed to extend nearly to the incisal surface and beveled off, the labial bevel to be given a convex, the lingual bevel a concave shape. After the porcelain rod has been shaped up and fitted to the canal, it is removed, and foil is burnished over the root surface to secure an accurate impression; the porcelain post is pushed through the foil into the root-canal and waxed in correct position to the foil; foil and post are removed, and the crown is built up in porcelain and baked. These porcelain rods may also be used instead of platinum pins for anchoring porcelain inlays in root-canals.

[*Dental Review*, Chicago, January 1915.]

ON THE CLINICAL VALUE OF PROFESSOR SCHROEDER'S APPLIANCE FOR ELECTRO-DENTAL DIAGNOSIS. By Dr. S. Endo, Dairen, China.

Among the tests suitable for diagnosing unhealthy conditions of the pulp, Endo has chosen electro-diagnosis as the subject of a series of carefully tabulated tests. This diagnostic measure has been known and practiced by men such as W. G. C. Fuyt of Amsterdam, J. E. Grevers of Amsterdam, Underwood, Hafner, Frohman, Tousey, and Professor Schroeder for about seventeen years, some employing the galvanic current of an induction coil. All the apparatus suggested for this purpose are identical in principle, though the writer prefers the method suggested by Professor Schroeder in *Correspondenz-Blatt für Zahnärzte*, 1905, No. 1. He has investigated this apparatus as an aid in determining the condition of the pulp, also the different reaction of the dental pulp to the electric current in individual patients. His studies lead him to the following conclusions: About 90 per cent. of the pulps of teeth affected with pyorrhea alveolaris are vital, even though the teeth be so loose as to be attached to the gum tissue by scarcely one-half of the apical third, and can be easily extracted with the fingers. In 100 per cent. of cases of dental caries and cracking of the enamel, electro-diagnosis will reveal the condition even though it be only very slight. There is a considerable difference in the reaction between inflamed and non-inflamed pulps. One cannot, however, determine accurately the extent of an inflammation. In practice it is not possible to distinguish definitely between sensation and pain. The response varies not only in different individuals, but also in the same tooth of the same patient, within twenty-four hours. To ascertain the degree of response of any tooth, therefore, it is necessary to make observations at least in the morning and evening. Since it is hardly possible to determine accurately the degree of response in each tooth, it is necessary to make control tests in the corresponding tooth of the opposite side. The presence of a pulp stone does not necessarily cause facial neuralgia; neither is it made apparent by the electric reaction, unless the apical third of the pulp is involved. The following points must be kept in mind in order to secure a correct diagnosis: Has the patient been taking sedatives or narcotics? The polarization of the battery increases the internal resistance and consequently reduces the voltage, rendering necessary more than one observation. The condition of the tooth and the patient's age and constitution must be reckoned with. For the observation, special care must be taken of the saline solution which flows out through the dental glass tube electrode. As the current used is an alternating one, it makes no difference whether the dental glass tube is connected with the positive or the negative pole. Electro-diagnosis in the writer's opinion is far superior to any other method, though it is not absolute in every case. In complicated cases, therefore, every possible diagnostic measure besides electro-diagnosis must be resorted to.

[*Zahnaerztliche Orthopaedie und Prothese*, Munich, November 1914.]

UNILATERAL DISTAL BITE, ITS SIGNIFICANCE AND TREATMENT. By Dr. A. Koerbitz.

Unilateral distal bite, in the writer's opinion, is not easier to treat than bilateral distal bite; in fact, it requires a greater number of individual operations than the latter. Careful prognosis of the treatment is essential in this anomaly, comparative studies of symmetry starting from the maxillary or median suture of the palate are of great value, since they indicate whether correction is to be made in the maxilla or mandible or in both, and how anchorage is to be obtained. Careful study of the median line shows symmetry of the two jaws in a small percentage of cases only. The typical condition found is as follows: The upper arch is symmetrical, but deformed very similarly as in bilateral distal bite. The lower arch is asymmetric. The first molar on one side is deviated distally as compared with that of the other side, as are the other teeth on that side up to the canine. The lateral on this side occupies more or less the position of the canine, hence the two centrals are pushed over to the other side, and the median line is displaced sometimes by the breadth of a whole tooth, which is therefore lost to its proper half of the arch, the width of which is that much reduced, causing a reduction in width of the entire arch. These observations determine the procedure in treatment. The lower arch is widened toward the neutral side, the extent of this widening being governed by the upper arch. The front teeth are then moved laterally in the same direction, the canine, bicuspids, and first molar on the other side to be moved mesially. In this movement the force of the screws of the expansion arch is very advantageously employed.

[*Journal of the American Medical Association*, Chicago, January 9, 1915.]

FRACTURES OF THE INFERIOR MAXILLA. A REPORT OF 1065 CASES TREATED. By Dr. H. S. Dunning, New York.

Dunning's remarkable report, which is the outcome of the writer's eight years' experience as oral surgeon to the New York College of Dentistry, the oral surgery clinic of which is fed by the out-patient department of nearly all of the large hospitals of Manhattan, is unique in the quantity and variety of material presented, making one wonder whether there has been any local war going on in Manhattan during the last few years which the daily press failed to feature. At any rate, it is regrettable that this report did not appear a few months before the European war started, as it would surely have proved of great value to the oral surgeons now busily engaged in repairing fractures of the jaws behind the various war fronts. Dunning remarks that the inferior maxillary bone, on account of its position and shape, is the most frequently fractured bone of the face, and about tenth on the list of fractures of all bones of the body. About 98 per cent. of all fractures of the body of this bone are compound when there are teeth present. Thus it is the most frequent bone to suffer compound fracture, and on account of this fact, these fractures become infected more frequently than any other. The patient suffers great pain from injury to the inferior dental nerve, also from inability to swallow, eat, drink, and cough. Mandibular fractures are about ten times as common in men as in women, the most prolific age being between thirty and forty. The most frequent cause of the fracture is a blow from the naked fist. The most frequently observed line of fracture is situated in the region of the left bicuspids. The fractures depend a great deal on the occlusion of the upper and lower teeth. Fractures of the condyles are rare, but are often followed by bony ankylosis. Fractures of the coronoid process are extremely rare, and occur only when the zygomatic arch and the side of the face are severely crushed. Great care should be exercised in keeping the mouth clean during treatment. A cap splint or single arch splint should be used whenever one or more strong teeth remain on either side of the line of fracture to which the splint may be cemented. The interdental splint or intermaxillary splint, in the writer's opinion, should be used only in children, in edentulous mouths, and in fractures posterior to the third molar when the upper and lower jaws cannot be wired together by means of Angle's wires and bands. The open operation or surgical wiring of the fractured ends of the bone is unnecessary, and generally results in infection and necrosis. The inferior maxillary bone can be more accurately reduced and held

in better coaptation than other bones, as direct force can be applied to it by means of appliances attached to the teeth. Lack of union very rarely occurs and is generally due to faulty and delayed treatment.

A radiograph should always be taken, to ascertain the line of fracture, to discover the presence of impacted teeth, and to note any infections or abscess conditions at the apices of the teeth near the point of fracture.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

Section IV.—*Dental Physics, Chemistry, Radiography, and Metallurgy.*

THE RÖNTGEN RAYS AS AN AID TO DENTAL DIAGNOSIS.

By Mr. J. Hall-Edwards, L.R.C.P., F.R.S.E., Hon. F.R.P.S., Senior Surgeon, and Radiographer, to the General Hospital, Birmingham, Eng.

The application of the Röntgen rays to dental diagnosis has created a new era in scientific dentistry. Its application was but a short time back looked upon as a luxury, but increased knowledge has proved it to be a necessity. The scope of its application is almost limitless. Knowledge, constant practice, and technical skill are necessary for the proper carrying out of the procedure. It is debatable whether dental radiographs should be produced by the dentist or by the radiographer.

The essayist discusses apparatus suitable for the dentist; the qualifications of a dental-radiographer; the difficulties presented in the production of useful radiographs; the interpretation of dental radiographs; X-ray tubes and tube-holders; X-ray plates and films, their development, fixing, and drying; prints and enlargements; stereoscopic radiography, its special usefulness in dental work; the educational value of radiography and its application to research; dangers and precautions; the diagnosis of obscure dental conditions; pyorrhea alveolaris, and some of the more common conditions in which the X-rays have proved of inestimable value.

He makes a plea for the more extensive use of radiography in dentistry.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

DENTAL SEPSIS AS A PREDISPOSING CAUSE OF CANCER.

By F. St. J. Steadman, D.P.H., M.R.C.S., L.R.C.P., L.D.S., Dental Surgeon to the West London Hospital; Dental Surgeon, Lecturer on Dental Histology, and Tutor to the National Dental Hospital and College, London, Eng.

The writer offers an analysis of the deaths from cancer in England and Wales during the four years 1901 to 1904, showing the parts of the body most frequently affected. This proves that in the male 85.1 per cent. and in the female 86.5 per cent. of all cancer, apart from that occurring in the sexual organs, occurs in the alimentary canal and its associated parts. Long-standing chronic inflammation in the sexual organs and in other parts of the body are known to predispose to the development of malignant disease. The great majority of persons suffering from cancer in the alimentary canal have advanced pyorrhea alveolaris, which has been present very many years. This advanced periodontal disease is not nearly so common in persons not suffering from cancer. There is no doubt that the constant swallowing of infective material from the mouth can, and frequently does, produce a chronic gastritis. The majority of patients suffering from cancer of the stomach have had chronic gastritis for many years prior to the development of the malignant disease.

PERISCOPE.

Emetin for Arresting Hemorrhage Following Tonsillectomy.—Emetin hydrochlorid hypodermically is being used successfully to arrest or prevent hemorrhage following tonsillectomy.—*Medical Summary.*

Keeping Impression Trays Clean.—The tray is cleaned, dipped into a pan of hot wax, and hung up to dry. This will give the tray a thin coating of wax. The impression is taken in the usual manner, and the plaster is removed from the tray by heating it over a flame, the wax treatment to be repeated after each use.—E. EUSTICE, *Dental Review.*

Keeping an Amalgam Mortar Clean.—After having thoroughly mixed the alloy and mercury, a few drops of alcohol are poured into the mortar and the amalgam is reground. The alcohol will clean the amalgam considerably, allowing a higher polish subsequently; moreover, when inverted, the amalgam will readily fall out of the mortar, leaving the latter clean. The alcohol can easily be drained out of the mortar before the amalgam is tipped out.—*Brit. Journ. of Dental Science.*

Removing Rust from a No. 7 Chuck Handpiece.—If through neglect or other cause, a No. 7 handpiece becomes rusty inside, it should be immersed in paraffin oil for some hours. When the paraffin oil does not unrust the handpiece quickly enough, the part just behind the tip of the nose should be held over a Bunsen flame, care being taken not to make it too hot, and it should be plunged when thus warmed into the paraffin. This always releases the internal part.—*Austral. Journ. of Dentistry.*

Removing Chloro-percha Stains from a Cavity.—After a root-filling has been inserted by means of chloro-percha, it is usually found that the surplus adheres to the walls of the cavity, and is very difficult to remove entirely. This can be readily done by dipping a pledget of cotton in absolute alcohol and swabbing out the cavity. Chloroform simply tends to spread the material more evenly over the walls, whereas the alcohol completely removes it.—W. J. T., *Austral. Journ. of Dentistry.*

Symptoms of Transition from Analgesia to Anesthesia.—Since analgesia merges into anesthesia, the symptoms which indicate the development of anesthesia should be closely watched. These may be enumerated in their usual order of onset as follows: Closing of the mouth; closing of the eyes, and staring as if blind; no response to questions; automatic, mechanical respiratory rhythm; snoring—which is rare, however; relaxed eyelids; slow rotating movement or else stationary position of the eyes; sluggishness of the pupils; purplish pink color of the nails and lips; general relaxation.—E. I. MCKESSON, *Dental Summary.*

Necessity of Using Saliva Ejector of Metal in Analgesia Operations.—If a patient becomes "tired" or drowsy during a dental operation under nitrous oxid and oxygen analgesia, he develops a tendency to close the mouth, which renders it necessary to use a metal saliva ejector in the place of the more frequently used glass type, for should the patient close the jaws firmly together, a glass ejector may be broken in the mouth, and unpleasant complications ensue. The "tired" feeling is dealt with by decreasing the percentage of nitrous oxid and automatically increasing the percentage of oxygen.—L. S. PILBEAM, *Brit. Dental Journal.*

Etiological Factors in the Genesis of a Narrow Palate.—Insufficient mastication during the period of the deciduous teeth leads to slight relative narrowing of the palate. As a result of this narrowing, the first upper permanent molars erupt too near the middle line and mesially to the position of their opponents, the first permanent lower molars. The misdirected pressure upon the upper jaw induced by this malocclusion, together with the consequent vicious eruption of the other permanent teeth, intensifies the narrowing of the palate, and the final ossification of the bone fixes it. In mouth-breathers the pressure of the soft parts of the face and the withdrawal of the tongue from the vault of the palate are probably also factors in the production of a narrow palate, but their influence is passive, and subsidiary to that of insufficient mastication.—D. M'KENZIE, *Internat. Journ. of Orthodontia.*

Soldering Perfect Joints in Crown Work with the Aid of Alexander's Gold.—A well-soldered joint may be obtained, when the bite is such as to render it difficult, in soldering a Richmond bicuspid or molar crown, to draw the solder well down to the joint between backing and occluding surface at the points of the cusps, by the following procedure: Enough Alexander's inlay gold is packed into this part after the case is invested and ready to heat with the aid of a suitably curved instrument, to fill completely the difficult portion; then the case is heated up and the soldering is done as usual. When the wax has burned out of the Alexander's gold, the solder will flow readily to the desired point, and the result will be gratifying. —G. H. W., *Northwest Journ. of Dentistry.*

Reconstructing Gold Inlay Margins.—When a flaw in an inlay margin presents, the inlay is placed in the cavity, and after drying the surface of the inlay with a hot-air syringe and alcohol, a small piece of Alexander's gold is burnished with a warm burnisher to the surface of the inlay, and over the exposed cavity margin. Then the whole is carefully removed from the cavity. This gold is incorporated with wax, which also serves as a flux; a small piece of 22-karat solder is placed where the gold is burnished to the inlay, and the case is set on the soldering frame. After the wax has burned out of the Alexander gold, the solder will flow and fill the remaining gold mesh. The inlay is then replaced in the cavity, burnished, and finished as usual.—G. H. W., *Northwest Journ. of Dentistry.*

Use of Pink Porcelain in Restoring Gingival Cavities.—In labio-gingival cavities, low-fusing porcelain can be used with greater facility than the high-fusing material. A gold matrix is easily adapted to this class of cavities, and when packed tightly with camphor gum, then lifted out and invested in ground asbestos, it will not change shape in the process of baking. In the case of a gingival cavity which is associated with much recession of the gum, the cavity including the exposed root, a very artistic effect may be produced by using pink enamel down to the natural gum line, the rest of the inlay being made of enamel to match the tooth at that part. The pink body should be built up thick enough to form a margin and festoon, like the natural gum. Such treatment takes away the elongated appearance of the tooth, and the result is quite pleasing.—H. B. Tileston, *Dental Summary.*

Clinical Course of Epulis.—The clinical course of epulis may be said to be absolutely definite. It is always slow. For a time these tumors gradually increase in size, and they may then remain stationary or more slowly increase in size. Few have been known to attain a large dimension, probably because of accident or operative interference. Bloodgood knew of a tumor which was allowed to remain for four years without destroying bone. In other words, the course of these tumors is essentially benign, and they may be considered devoid of an invasive character. They appear first at the margin of the tooth socket, the pedicle being attached to the periosteum. They are very frequently, at first, posterior to the tooth. Increasing in size, they surround the tooth and appear upon the opposite side. As the growth increases, other teeth may be surrounded. They always, however, remain surface growths, never invading the bone beneath except as a result of unusual pressure conditions.—W. Carr, *Journ. Allied Dental Societies.*

Oral Sepsis and Extraction.—The recent interesting discussions in the *Lancet* on "Pyorrhea and Extraction" should do something to stimulate more extended—and possibly more exact—observation of cases. In some cases marked benefit followed the extraction of teeth; in other cases teeth were condemned presumably upon the same kind of evidence and extracted, yet there was no compensating improvement for the loss of the teeth that were in themselves sound and useful. In endeavoring to control the swing of the pendulum in this matter of oral sepsis, the difficulty is that, when one is very much alive to the dangers of sepsis, he will hardly be satisfied with any partial application of the radical treatment, in which extraction only of the worst teeth may or may not be followed by an improvement in health. An observed gain in health that falls short of complete recovery is apt to encourage further extractions of doubtful teeth, while, if no improvement takes place after the first removals, suspicion is concentrated on any remaining tooth or teeth that show signs of sepsis. The disappearance or abatement of certain symptoms of general ill health, which has often been brought about by the skilful cleansing and conservative treatment of the dental tissues, certainly helps to strengthen the case against any passive toleration of sepsis, but at the same time such experiences ought properly to be sufficient to check the advocacy of extraction on suspicion.—*Dental Record.*

Aluminum-Vulcanite Plates.—An aluminum plate with teeth attached by vulcanite forms a very light denture, is comfortable to wear, and of little bulk. It is very well known, however, that after being for some time in use, the vulcanite is liable to separate from the aluminum. A method of obviating a breakdown from this cause would probably lead many practitioners who have abandoned the combination to try it afresh. When the case is ready for rubber packing, the cleaned aluminum surface is coated with a thin solution of rubber in chloroform, and over this when dry is carefully packed a layer of weighted rubber, and the further filling of the mold space completed with ordinary rubber. Those who have tried this method claim that the attachment between vulcanite and aluminum remains sound, and a stable union between the two materials is secured. A similar use of weighted rubber was some years ago found very serviceable with other metals in attaching teeth by vulcanite to "wire bar" lower cases; the resulting union was so very close and intimate that hardly anything short of filing or chiseling would effect their separation.—*Dental Record.*

Copper Cements.—There are but two oxids of copper, cupric or black, and cuprous or red; copper cement can only be one of these colors, as no other compound of copper has cementing action with phosphoric acid.

To call any cement a copper cement, simply because it has some copper in it, is a misnomer. Suspicion is at once aroused by this play of words. Copper salts added to a zinc oxid powder with the object of calling the latter a copper cement merit suspicion, to say the least. The fact is that, if enough copper salt is added to give the known effects of true copper cement, the zinc cement will be injured to such an extent as to be worthless. There is no object, from the dental viewpoint, of having a red cement. Hence, when a cement is colored red, and a small amount of copper salt added and the compound sold as red copper, the intention is to deceive. This is being done because red oxid of copper has been shown to have decided advantages over the black. To detect this imposition is very easy. Some of the suspected powder is burnt with a match; if it is wholly or in large part composed of cuprous oxid, it will be converted to the black, and prove itself. Better still, a small amount of the powder is spatulated with the liquid which comes with it. The mix should turn very much darker than the original powder, because one part of the copper present is changed to the metallic state. On the other hand, if the mix stays red and does not turn very noticeably darker, the cement does not owe its color to the presence of red oxid of copper.—W. S. Medell, *Journ. Allied Dental Societies.*

Air-pressure Appliance for Testing the Contraction of Amalgam Alloys.—The following appliance for testing the contraction of amalgam alloys by air-pressure, similar to that suggested by Dr. Southwell of Milwaukee, is very simple, consisting of a pressure tank with pump and gage. The air is conducted from the tank to four taps, to which the steel models with test fillings are screwed, and immersed in water for the test. The models are made in steel with two forms of cavities; one is a simple round cavity, the other is made to represent an approximo-occlusal cavity similar to what we might find in molars. The walls are exactly parallel, and there is no bevel to the margins. They are so made that some part of the seat of the cavity consists of the flat end of a screw that is to be removed when the filling is completed, so that the model may be placed upon the testing appliance for the pressure test.

To make the tests, the fillings should be placed in a glass dish of very clear water, so that they may be seen from all sides. The air pumping should be begun very slowly, that the margins of all the fillings may be carefully watched for bubbles of air that may begin to leak at a very low pressure. Indeed, it is surprising how little pressure is required to cause air to pass about the great majority of fillings. Of 110 fillings made and tested by this appliance, 42 resisted a pressure exceeding two pounds without leaking air about the margins. All the balance leaked at from a few ounces to two pounds of pressure. A very few fillings failed to leak at the maximum pressure of 45 pounds. A large number leaked at so low a pressure that the gage would not register. Twenty-six different operators took part in these tests, and it is quite unnecessary to say that they all did their best. There were 23 different alloys used, and I have spent every effort to test out those that were the best-known and the most popular. I feel safe in saying that of this number of alloys only three are well enough balanced to make a perfectly and permanently tight filling. If a few ounces of pressure will cause a violent leakage of air about the margins of a filling, we have no reason to believe that such a filling in human teeth would resist the ingress of moisture and bacteria under such air-pressure as might be exerted in the human mouth, or under the pressure in the act of masticating certain hard and sticky foods.—W. G. Crandall, *Items of Interest.*

OBITUARY.

DR. SAMUEL E. FRICK, JR.

DIED, October 21, 1914, in Philadelphia, Pa., of meningitis, in his twenty-third year, SAMUEL EDWIN FRICK, JR., D.D.S.

Upon the eve of starting a promising dental practice, Dr. Samuel Edwin Frick, Jr., fell victim to meningitis and passed away on October 21, 1914. He was the son of Dr. Samuel E. Frick, Sr., and Mary A. Frick, was born in Philadelphia on January 15, 1892, and attended the public schools of his home city. He entered the dental department of the University of Pennsylvania in September 1911, whence he was graduated in June 1914 with the degree of D.D.S. To quote the *Penn Dental Journal:* "Through the death of Dr. Frick the profession has lost one of its most promising members. The men of 1914 will remember him as a true and sympathetic friend, a conscientious student, a painstaking and careful workman, and a loyal Pennsylvanian."

Interment was at Holy Cross cemetery.

"IN MEMORIAM" RESOLUTIONS.

Dr. James Truman.

AT a meeting of the American Academy of Dental Science, Boston, Mass., the following preamble and resolution were adopted:

Prof. James Truman, one of the most distinguished of the associate members of the American Academy of Dental Science, died at his home in Philadelphia, November 26, 1914, in the eighty-eighth year of his life. The loss of Professor Truman will be deeply mourned wherever dentistry is practiced. He was one of the founders of his profession, and one of the best exponents of its larger possibilities. He was also one of our foremost teachers, and the students who sat under his instruction reverenced him as they would a father. All who came in contact with Dr. Truman realized the exalted nature of the man and his nobility of character, his love of mankind, and his charity for all. His was a fully rounded life, beginning early with large promise, equaling every anticipation in its maturity, fertile and beautiful to its close in the ripeness of its well-filled years.

Dr. Truman began the study of dentistry with his father, who was both a dentist and a physician. He was graduated at the Philadelphia College of Dental Surgery in 1854. In 1864 he accepted the position offered him as demonstrator in chief of operative dentistry in the college from which he was graduated. In 1865 Dr. Truman was elected to fill the chair of dental physiology and operative dentistry in the Pennsylvania Dental College, and he held that position until 1870, when he resigned. He was the editor of the *Dental Times* during this professorship, and during the four years of its existence the productions of his pen were published in this journal. On account of his health, he went to Germany and settled at first in Frankfort, practicing a year there. He then went to Hanover, and had among his patients many of the nobility and the wealthy residents of that province. In 1880 he returned to America and began practice in Philadelphia again. In 1882 he was elected professor of dental pathology, therapeutics, and materia medica in the department of dentistry of the University of Pennsylvania. In 1883 he was made secretary, and subsequently dean, which position he held until he retired in 1896. In 1890 he became the editor of the *International Dental Journal*, and he held that position until the publication ceased in 1905. He received the degree of LL.D. from the University of Pennsylvania in 1904.

Professor Truman was one of the pioneers of organized professional dentistry, and he brought to the solution of its problems a commanding personality, a vigorous and at times an aggressive intellectuality, a masterful command of language, and a dignity and forcefulness of mind which inevitably carried conviction to his hearers. We feel that no tribute to his memory can be too generous or too universal. Therefore be it

RESOLVED, That in the death of Professor Truman the American Academy of Dental Science loses one of its most distinguished fellows, who has been a signal honor to his profession, whose life was full of simplicity,

tenderness, and personal charm, whose advanced years were as beautiful as his manhood and his youth—a man who was loved wherever known.

R. R. ANDREWS,
EDWARD C. BRIGGS,
T. O. LOVELAND,
Committee.

Dr. C. H. Robinson.

THE Minnesota State Dental Association passed on February 12, 1915, the following preamble and resolutions prepared by the committee appointed to prepare an expression of the loss sustained by the death of Dr. C. H. Robinson:

Whereas, it has pleased Almighty God in His wise providence to remove from our midst and from this earth our beloved and highly esteemed brother Dr. C. H. Robinson, who died January 23, 1915; and

Whereas, by his death the commonwealth has lost a citizen of the highest type and the profession an eminent and highly respected member, who throughout his career was ever among the foremost in working for the advancement for his fellow men; and

Whereas, by his death the Minnesota State Dental Association has sustained an irreparable loss; therefore be it

RESOLVED, That we, the Minnesota State Dental Association, feeling that we have sustained a great loss, hereby express our sorrow caused by the sudden culmination of this brother's noble career; and be it further

RESOLVED, That a copy of these resolutions be spread upon the minutes of this association, and a copy be sent to the bereaved family and to the journals for publication.

J. W. GALLAGHER,
W. D. JAMES,
R. W. BERTHEL,
Committee.

Dr. J. N. Crouse.

AT the annual meeting of the Dental Protective Association, held in December 1914, it being the first meeting subsequent to the death of Dr. Crouse, a committee was appointed to prepare for publication a statement which might serve to show the appreciation of the members of the association for the character and great services to the dental profession of Dr. J. N. Crouse, who organized the association and was its president and executive head until shortly before his death. The statement follows:

DR. J. N. CROUSE.

Dr. J. N. CROUSE displayed great ability and tremendous force of character, and an enthusiasm and perseverance which finally overcame the general indifference and much active opposition of the dental profession and won a sufficiently numerous membership in the Protective Association to provide enough funds to resist successfully the claims of the Crown and Bridge Co. The defense was so complete that the Crown and Bridge Co. never collected anything of consequence from the dental profession. If the dentists had been obliged, for a year or two at first, to pay the licenses demanded by the Crown Co. as they had previously done for many years to the Goodyear Dental Vulcanite Co., the great services rendered by Dr. Crouse through the Dental Protective Association would have been universally acknowledged. As it was, appreciation of his services was less in evidence than a persistent and essentially unfair complaint and criticism of Dr. Crouse personally, and of his management of the affairs of the Protective Association. It did not seem to be understood that a plan of organization similar to that of our dental societies is not well adapted to fight a legal battle. It was indispensable, as in war, that one man should be in supreme command, able to choose his own helpers and subordinates, and to command the entire resources of the association for instant action whenever necessary. So far as appears, there was no other man in the dental profession who had the ability and the willingness to make the personal sacrifices necessary to accomplish what he did. The value of his services to the profession can never be known; that it amounted to millions of dollars there is no room to doubt.

Dr. Crouse always took an active interest in the welfare and progress of his profession, and for many years he was a familiar figure to all who attended dental society meetings anywhere. He came to Chicago from Mount Carroll, where he was then practicing, to become one of the charter members of the Illinois State Dental Society, and for some time before his death he was the only surviving charter member who had maintained his membership continuously. He was active in the administrative affairs of the three principal societies to which he belonged—the Chicago Dental Society, the Illinois State Dental Society, and the American Dental Association, which was merged into the present National Dental Association. He was president of each

of them, and was for many years a member of the executive committee of the American Dental Association.

The last important service to the Dental Protective Association was the arrangement with Dr. Taggart by which the members of the association received licenses under his patents for a trifling sum—less than a dollar a year for the terms of the patents. In this he had the active assistance of the other directors, Dr. C. N. Johnson and Dr. J. P. Buckley, and without all three of them the plan probably would have failed.

Dr. Crouse did not receive in his lifetime the honor and appreciation from his profession that his great services deserved, and which undoubtedly will be accorded to him in the future. He will have a place among the great benefactors of the dental profession.

EDMUND NOYES, *Chairman*,
J. E. HINKINS,
C. E. BENTLEY.

SOCIETY NOTES AND ANNOUNCEMENTS.

DENTAL SOCIETY MEETINGS:

May, June, and July.

MAY.

ARKANSAS STATE DENTAL ASSOCIATION. Little Rock. Three days: May 13th to 15th.

DENTAL SOCIETY OF THE STATE OF NEW YORK. Albany. Three days: May 13th to 15th.

ILLINOIS STATE DENTAL SOCIETY. Peoria. Four days: May 11th to 14th.

INDIANA STATE DENTAL ASSOCIATION. Indianapolis. Three days: May 18th to 20th.

INTERSTATE ASSOCIATION OF ANESTHETISTS. Cincinnati, Ohio. Two days: May 4th and 5th.

KANSAS STATE DENTAL ASSOCIATION. Topeka. Three days: May 25th to 27th.

LAKE ERIE DENTAL ASSOCIATION. Cambridge Springs, Pa. Three days: May 20th to 22d.

MASSACHUSETTS DENTAL SOCIETY. Boston. Three days: May 5th to 7th.

NATIONAL DENTAL PROTECTIVE ASSOCIATION. Washington, D. C. May 18th.

NEBRASKA STATE DENTAL SOCIETY. Omaha. Three days: May 18th to 20th.

SUSQUEHANNA DENTAL ASSOCIATION OF PA. Wilkes-Barre. Three days: May 18th to 20th.

TEXAS DENTAL COLLEGE. All-day clinic. May 18th.

TEXAS STATE DENTAL ASSOCIATION. Galveston. Four days: May 19th to 22d.

VERMONT STATE DENTAL SOCIETY. Three days: May 19th to 21st.

JUNE.

FLORIDA STATE DENTAL SOCIETY. Passagrille. Three days: June 9th to 11th.

KENTUCKY STATE DENTAL ASSOCIATION. Ashland. Three days: June 8th to 10th.

LOUISIANA STATE DENTAL SOCIETY. New Orleans. Three days: June 3d to 5th.

MAINE DENTAL SOCIETY. Portland. Three days: June 28th to 30th.

MINNESOTA STATE DENTAL ASSOCIATION. Minneapolis. Two days: June 11th and 12th.

MISSOURI STATE DENTAL ASSOCIATION. Jefferson City. Three days: June 10th to 12th.

NEW HAMPSHIRE DENTAL SOCIETY. Weirs. Three days: June 22d to 24th.

NORTH CAROLINA DENTAL SOCIETY. Wrightsville Beach. Three days: June 23d to 25th.

PENNSYLVANIA STATE DENTAL SOCIETY. Reading. Three days: June 22d to 24th.

TENNESSEE STATE DENTAL ASSOCIATION. Sewanee. Three days: June 24th to 26th.

JULY.

NEW JERSEY STATE DENTAL SOCIETY. Asbury Park. Four days: July 21st to 24th.

Examiners' Meetings.

CALIFORNIA BOARD OF EXAMINERS. San Francisco, June 4th; Los Angeles, June 18th.

DISTRICT OF COLUMBIA BOARD OF EXAMINERS. Washington. June 7th to 10th.

Illinois Board of Examiners. Chicago. June 10th.

Indiana Board of Examiners. Indianapolis. June 14th to 19th.

Iowa Board of Examiners. Iowa City. June 7th.

Maine Board of Examiners. Augusta. July 1st to 3d.

Maryland Board of Examiners. Baltimore. May 27th and 28th.

Michigan Board of Examiners. Ann Arbor. June 14th to 19th.

Montana Board of Examiners. Helena, Mont. July 12th to 15th.

Nebraska Board of Examiners. Lincoln. June 9th.

New Hampshire Board of Registration. Manchester. June 14th to 16th.

New Jersey Board of Registration. Trenton. June 28th to 30th.

North Carolina Board of Examiners. Wrightsville Beach. June 21st.

Oklahoma Board of Examiners. Oklahoma City. June 14th.

Pennsylvania Board of Examiners. Philadelphia and Pittsburgh. June 9th to 12th.

South Carolina Board of Examiners. Columbia. June 15th.

Texas Board of Examiners. Dallas. June 21st.

Vermont Board of Examiners. Montpelier. June 28th to 30th.

Virginia Board of Examiners. Richmond. June 8th.

West Virginia Board of Examiners. Charleston. June 9th.

Wisconsin Board of Examiners. Milwaukee. June 21st.

DENTAL RED CROSS FUND.

At the meeting of the American Institute of Dental Teachers held at Ann Arbor, Michigan, on January 26th, it was decided to take steps that should result in the raising of a fund to be used through the Red Cross Society in giving relief and aid to the soldiers in Europe who are suffering from oral and dental injuries. The president was instructed to appoint a committee to take charge of this matter. President F. W. Gethro, under this instruction, appointed the following Executive and General committees:

Executive Committee.

C. R. E. Koch, *Chairman;* John F. Biddle, *Sec'y;* Henry W. Morgan, E. A. Johnson, Ellison Hillyer.

General Committee.

E. C. Kirk, Philadelphia.
J. H. Kennerly, St. Louis.
H. C. Miller, Portland, Ore.
D. M. Gallie, Chicago.
John F. Biddle, Pittsburgh.
E. T. Darby, Philadelphia.
Alfred Owre, Minneapolis.
B. Holly Smith, Baltimore.
E. A. Johnson, Boston.
Frank Holland, Atlanta.
D. M. Cattell, Memphis.
Frederick R. Henshaw, Indianapolis.
S. W. Bowles, Washington.
E. H. Smith, Boston.
A. H. Hipple, Omaha.
Ellison Hillyer, New York.
Truman W. Brophy, Chicago.
D. H. Squire, Buffalo.
H. E. Friesell, Pittsburgh.
Henry W. Morgan, Nashville.
I. N. Broomell, Philadelphia.
Wallace Wood, New Orleans.
Frank T. Breene, Iowa City.
H. L. Banzhaf, Milwaukee.
J. G. Sharp, San Francisco.
G. V. Black, Chicago.
W. T. Chambers, Denver.
H. M. Semans, Columbus.
J. D. Patterson, Kansas City.
N. S. Hoff, Ann Arbor.
C. N. Johnson, Chicago.
H. L. Wheeler, New York.
L. E. Ford, Los Angeles.
C. R. E. Koch, Chicago.
H. B. Tileston, Louisville.

The Executive Committee is preparing contribution certificate booklets, each containing twenty certificates or coupons certifying that the holder thereof has contributed twenty-five cents to this fund. This certificate will be neatly lithographed, something like national currency. It will be printed in lilac ink—the color of the dental profession—and bear upon its face the red Geneva cross.

It is hoped that the dental schools, dental students, and dental societies, as well as the profession at large, will become sufficiently interested in this propaganda to secure a

large enough fund through these small contributions to secure real relief for the class of war sufferers for which it is designed. That it may aid in the establishment of several special hospitals or wards devoted to dental and oral surgical injuries, within the belligerent zone of Europe, is the ultimate purpose of this movement.

Make applications for booklets to any member of Executive or General Committees.

INTERSTATE ASSOCIATION OF ANESTHETISTS.

The Interstate Association of Anesthetists will hold its organization meeting in conjunction with the Ohio State Medical Association in Cincinnati, Ohio, May 4 and 5, 1915, at which time an elaborate scientific program devoted exclusively to recent advances in anesthesia and analgesia will be presented, as follows:

"Foreword," Robert Carothers, Councilor First District O. S. M. A. "Selection of the Anesthetic," Emmett F. Horine, Louisville, Ky. "Nitrous Oxid Anesthesia in Obstetrics," Arthur E. Guedel, Indianapolis, Ind. "Blood-pressure under General Anesthesia," E. I. McKesson, Toledo, O. "Conductive Analgesia for Intra-oral Operations," Hugh MacMillan, Cincinnati, O. "Alkaloidal Medication in Relation to Anesthesia and Analgesia," Isabella C. Herb, Chicago, Ill. "Anesthesia for Brain Surgery," Charles K. Teter, Cleveland, O. "Use of Music During Analgesia." W. P. Burdick, Kane, Pa. "Magnesium Sulfate Narcosis," D. D. DeNeen, Cincinnati, O. "Ethyl Chlorid Anesthesia," R. A. Rice, Columbus, O. "Intravenous Anesthesia," C. L. Candler, Detroit, Mich. "Preparatory, Operative, and Post-operative Precautions for Hazardous Anesthetic Risks," Moses Salzer, Cincinnati, O. "Vapor Anesthesia for Intra-oral Operations," Paul R. Coble, Indianapolis, Ind. "Local Anesthesia for Hernia Operations," Chas. T. Souther, Cincinnati, O. "Surgical Mortality from the Standpoint of the Anesthetist," H. W. Kearney, Washington, D. C. "Nitrous Oxid-Oxygen Analgesia in Dentistry," Edward S. Barber, Chicago, Ill. "Posture and Muscular Relaxation as Factors in the Newer Conception of Shock," Willis D. Gatch, Indianapolis, Ind. "Spinal Anesthesia," John Overton, Tulsa, Okla. "Acapnia," E. M. Sanders, Nashville, Tenn. "Local Analgesia for Nose, Throat, and Larynx Operations," Myron T. Metzenbaum, Cleveland, O. "Anesthesia a Full-fledged Specialty," W. Hamilton Long, Louisville, Ky. "Anesthesia, Anesthetists, and Workmen's Compensation Laws," F. H. McMechan, Cincinnati, O. "Intratracheal Anesthesia," B. Merrill Ricketts, Cincinnati, O. With Demonstration of a Portable Field Apparatus by Major Allie Williams, U. S. A., Washington, D. C.

Headquarters, assembly-room, and exhibits will be in the new Hotel Gibson, in which all the sections of the Ohio State Medical Association will also meet. An informal organization dinner will be served on the evening of May 4th, after which the visiting anesthetists will be the guests, at a "smoker," of the Local Entertainment Committee, headed by Dr. E. O. Smith. Visiting ladies will be entertained by Dr. Nora Crotty and her committee at a reception and theater party.

Anesthetists, surgical and dental, as well as interested surgeons and general practitioners who wish to participate in the proceedings are cordially invited to attend. For further information and dinner reservations address

F. H. McMechan, M.D., *Sec'y*,
1044 Wesley ave., Cincinnati, Ohio.

NATIONAL MOUTH HYGIENE ASSOCIATION.

A series of illustrated lectures on Mouth Hygiene has been prepared by this association for rental service. The first lecture of the series, a talk suitable for a mixed adult audience or school pupils above the age of twelve years (designated as lecture "A") is now ready. The lecture set (manuscript and 36 slides) will be furnished to members of state dental societies and others who may be considered competent to present the matter to the public, at a fee of One Dollar per use.

For further particulars and application blanks, address the Director of Extension Lectures,

Edwin M. Kent, D.M.D.,
222 Washington st., Brookline, Mass.

Panama-Pacific Dental Congress.

PRELIMINARY REPORT ON TRANSPORTATION.

By Dr. JOS. D. EBY,
NATIONAL TRANSPORTATION COMMISSIONER,

Member of the Transportation Committees of the International Dental Congress and of the National Dental Association.

ATTENTION OF SOUTHERN DENTISTS!

The time is now approaching when all members of the National Dental Association should begin to consider seriously their prospective plans of attending the joint session of the National Dental Association and the International Dental Congress, to be held in San Francisco, at the Panama-Pacific Exposition, August 30th to September 9th. This is the opportunity of a lifetime to combine business and pleasure in a western trip.

The wide range for the selection of literary and clinical material, also exhibits, have placed the International Dental Congress meetings of the past among the greatest in dental history. The organization of this congress has been at work more than two years, and it is safe to predict that it will eclipse all similar meetings of the past.

A great accession of knowledge can be gained from this meeting; its value should be placed at the highest mark, and the expense and time necessary to attend should bring great inspiration to our profession, as well as immediate practical returns. Assuredly, the grandeur of our western scenery, and the delightful climate of the season should determine the fact that "This is my year to take a trip West." The question of itinerary is governed almost entirely by the time one wishes to spend. Stopovers and varied routings can be arranged with practically no additional transportation expense, excepting over the northern lines.

As a member of the Transportation Committee, National Dental Association, also the same committee, Panama-Pacific Dental Congress, from the territory including North Carolina, South Carolina, Tennessee, Georgia, Florida, Alabama, and Mississippi, much time has been spent in considering the numerous routes, etc., with a view toward being able to make the best recommendations to members from this territory.

I beg to advise that, after careful consideration, I have decided that the most practical, attractive, and best way for dentists in the Southeast who expect to attend this meeting will be to make New Orleans a concentrating point. I have therefore arranged with the Southern Pacific Railroad to operate special private Pullman sleeping-cars from New Orleans through to Los Angeles, on the following schedule:

	P.M.	Aug.	So. Pac. Train.
l New Orleans	11.30	19th	No. 9
a Houston	11.30	20th	"
l "	11.50	20th	"
a San Antonio	7.20	20th	"
l " "	8.50	20th	"
a El Paso	6.30	21st	"
l " "	6.00	22d	"
a Los Angeles	9.20	23d	"
	A.M.		
l " "	7.25	28th	" 21
	P.M.		
a San Francisco ..	10.55	28th	"

Stopovers.

San Antonio—1 hour 5 min.
El Paso—25 hours 50 min.
Los Angeles—4 days.

You will note this schedule shows our arrival in El Paso 6.30 P.M. on 21st, leaving 6.00 P.M. on 22d, or a stopover at that point of approximately twenty-four hours. Delegates can spend the night on car, using berths, instead of hotels. This is arranged on account of invitation extended by the El Paso Chamber of Commerce offering us an excellent free trip in and around the city of El Paso, together with side trip over the borderline to the city of Juarez, Mexico, which will prove very enjoyable. Also note that a stopover is made at Los Angeles of four days, which is arranged for sightseeing in and around that city, together with plenty of time to make side trip to San Diego, to see the Exposition at that point without additional transportation expense.

On arrival in Los Angeles, the private Pullman cars will be dispensed with, and from there to San Francisco, Pullman parlor observation cars will be used, and the schedule as shown is via the Coast Line division of the Southern Pacific Railroad, which takes in all of the world-famous resorts of California, such as Santa Barbara, San Luis Obispo, Paso Robles Hot Springs, Del Monte, Mon-

terey, Santa Cruz, Pacific Grove of Big Trees, San José, etc., arriving in San Francisco on the night of the 28th, thirty-six hours before our meeting convenes.

I will also state that the trains on which these special cars will move carry dining and observation cars, etc.; in fact, all features that go to make up the best there is to be had in train service.

Stopovers at any and all points desired will be allowed by the railroads, going and returning, within final limit of tickets, which will be three months from date of sale.

The New Orleans gateway is by far the most logical and convenient for a concentrating point, of any in the Southeast, and I trust you will give this matter serious consideration, and arrange to join this party so that we can all travel in one body.

On going trip, be sure and have your ticket routed via New Orleans, and Southern Pacific Railroad to San Francisco. Returning, would suggest following lines, which can be secured for the same rate, namely, Southern Pacific to Ogden, D. and R. G. to Denver, U. P. to Kansas City, Wabash to St. Louis, L. and N. to Nashville, thence any direct line to starting-point.

The Southern Pacific line from San Francisco takes in the beautiful part of California known as the Lake Tahoe region. Side trip can be made from Truckee, a main-line point, through the Lake regions, including boat trip of seventy-five miles around the Lakes, for $5.00. Thence to Ogden, from which point a side trip can be made through the Yellowstone National Park, consisting of round-trip railroad fare, four nights' lodging, and thirteen meals while in the Park, at the rate of $53.50. Thence return to Salt Lake, where, after seeing the sights of this wonderful city, the D. and R. G. can be used to Colorado Springs; at this point "Manitou," the "Garden of the Gods," and Pike's Peak are to be seen. Thence to Denver, sightseeing in and around the city, visiting the world-famous Indian congresses, etc. From Denver would suggest Union Pacific lines to Kansas City, Wabash line to St. Louis, L. and N. to Nashville, thence by any direct line from that point to original starting-point.

The following are the rates applying from some of the most prominent points in the states of the Southeast, for the trip as outlined above; also rate covering trip for those who may desire to take in Portland, Seattle, and the North Pacific coast. Correspondingly low rates are offered by the railroads from all other points in this territory.

	Via Direct Routes.	Via N. Pac. Coast.
Atlanta, Ga.	$71.90	$95.00
Macon, Ga.	72.00	96.85
Augusta, Ga.	78.25	101.60
Savannah, Ga.	80.50	104.50
Chattanooga, Tenn.	66.95	88.40
Knoxville, Tenn.	72.55	91.00
Nashville, Tenn.	63.50	85.25
Memphis, Tenn.	57.50	81.20
Asheville, N. C.	79.05	97.50
Charlotte, N. C.	84.15	102.32
Raleigh, N. C.	87.95	106.12
Winston-Salem, N. C.	84.15	102.32
Spartanburg, S. C.	81.50	101.00
Charleston, S. C.	85.15	106.85
Columbia, S. C.	82.45	104.24
Greenville, S. C.	80.00	101.00
Birmingham, Ala.	63.50	88.40
Montgomery, Ala.	63.50	88.40
Mobile, Ala.	63.50	88.40
Jacksonville, Fla.	80.50	104.50
Tampa, Fla.	89.00	113.00
Palatka, Fla.	82.70	106.70
Columbus, Miss.	58.30	84.55
Greenwood, Miss.	57.50	83.75
Meridian, Miss.	57.50	83.75
Hattiesburg, Miss.	57.50	83.75

Approximate charge for lower berth in Pullman sleeping-car to make direct round trip as outlined above, including stopovers at prominent points, from New Orleans, would be $32.00. The North Pacific Coast Tour, via Portland, etc., would be approximately $42.00.

It will be my pleasure to see that you are furnished with any other detailed information you may desire in regard to rates, tickets, limits, stopovers, side trips, etc. You can address letter either to myself or to Mr. D. L. Griffin, agent Southern Pacific Co., Atlanta, Ga., and such information as you desire will be furnished you promptly, together with literature pertaining to California, the Expositions, and the Dental Congress. Either of us will make sleeping-car reservations for you on receipt of advice as to what is wanted in this respect.

Please let us hear from you.

Jos. D. Eby, D.D.S., Atlanta, Ga.,
Nat'l Transportation Commissioner.

NATIONAL DENTAL PROTECTIVE ASSOCIATION.

THE annual meeting of the National Dental Protective Association will be held in Washington, D. C., May 18, 1915, at the Dental Department of George Washington University, at 7.30 P.M., for the election of trustees and transaction of business.

E. P. DAMERON, *President*,
M. F. FINLEY, *Sec'y*.

HOUSTON (TEXAS) DENTAL COLLEGE.

SPECIAL DENTAL MEETINGS AND OPENING OF NEW BUILDING.

THE directors and faculty of the Texas Dental College of Houston, Texas, and the Alumni Association of the Texas Dental College have concluded arrangements for an all-day clinic to be held on May 18, 1915, and to every dentist in the state of Texas, and to as many out of the state as desire to be present, a cordial invitation is extended to attend.

Dr. Chas. C. Bass of New Orleans, who has done much work on the subject of oral endamœbæ and their relation to pyorrhea alveolaris, and who is considered an authority on the subject, has accepted an invitation to be present, and will give a complete lecture, and demonstrate the use of emetin hydrochlorid, with the methods, technique, etc., for successfully combating the ravages of this heretofore dreaded disease.

During the day there will be papers and demonstrations appertaining to dentistry by men of recognized standing in this profession.

The 18th of May will also mark the opening of the new college building of the Texas Dental College. The commencement exercises will take place on the same date, in the evening at Beach's Auditorium, beginning at 8.30 P.M., and will be followed by the annual banquet of the Alumni Association.

The new college building will be located at the corner of Franklin ave. and Fannin st., in the heart of the city, and when completed will be one of the finest and best equipped dental colleges in the southwest.

Efforts are being made to secure special rates to Houston, so that those attending the meeting of the State Dental Association at Galveston the following day may have an opportunity to hear Dr. Bass.

C. H. EDGE, *Sec'y*,
Houston, Texas.

MASSACHUSETTS DENTAL SOCIETY.

THE fifty-first annual meeting of the Massachusetts Dental Society will be held May 5, 6, and 7, 1915, in the Hotel Somerset, Boston, Mass.

A. H. ST.C. CHASE, *Sec'y*.

VERMONT STATE DENTAL SOCIETY.

THE dates of next meeting of the Vermont State Dental Society are May 19, 20, and 21, 1915.

P. M. WILLIAMS, *Sec'y*,
Rutland, Vt.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA.

THE fifty-second annual meeting of the Susquehanna Dental Association will be held at Irem Temple, Wilkes-Barre, Pa., May 18, 19, and 20, 1915.

GEO. C. KNOX, *Recording Sec'y*.

LAKE ERIE DENTAL ASSOCIATION.

THE fifty-second annual meeting of the Lake Erie Dental Association will be held at Hotel Bartlett, Cambridge Springs, Pa., May 20, 21, and 22, 1915.

J. F. SMITH, *Sec'y*,
Erie, Pa.

KANSAS STATE DENTAL ASSOCIATION.

THE Kansas State Dental Association will hold its next annual meeting at Topeka, Kans., May 25, 26, and 27, 1915.

A most unique program will be presented. Dr. Thos. P. Hinman of Atlanta, Ga., will be the guest of honor.

A. L. BENTON, *Sec'y*,
Garnett, Kans.

ILLINOIS STATE DENTAL SOCIETY.

The fifty-first annual meeting of the Illinois State Dental Society will be held at Peoria, May 11, 12, 13, and 14, 1915.

J. N. Barcus, *President*,
Henry L. Whipple, *Sec'y*.

NEBRASKA STATE DENTAL SOCIETY.

The forty-eighth annual meeting of the Nebraska State Dental Society will be held in Omaha, Nebr., May 18, 19, and 20, 1915.

Wm. A. McHenry, *President*,
H. J. Porter, *Sec'y*,
Cambridge, Nebr.

INDIANA STATE DENTAL ASSOCIATION.

The next annual meeting of the Indiana State Dental Association will be held in Indianapolis, on May 18, 19, and 20, 1915. A distinctive feature of this meeting will be that the program will be made up exclusively of Indiana dentists. A cordial invitation is extended to members of other dental societies to attend the meeting.

A. R. Ross, *Sec'y*,
Lafayette, Ind.

TEXAS STATE DENTAL ASSOCIATION.

The thirty-fifth annual meeting of the Texas State Dental Association will be held in Galveston, Texas, May 19, 20, 21, and 22, 1915. The special feature of this meeting will be postgraduate lectures and clinic work.

Dr. G. Walter Ditmar of Chicago will present modern scientific bridge work and removable partial dentures, with preparations, technique, and principles involved. Dr. B. F. Thielen will present "Plate Work." Dr. T. G. Duckworth, "Orthodontia." Dr. R. D. Griffis, "Nitrous Oxid Analgesia and Anesthesia." Dr. Julian Smith, "Pyorrhea." Dr. J. M. Murphy, "Local Anesthesia."

Exhibitors are requested to attend, and to write to Dr. A. L. Frew, Dallas, for space. General clinics on last day. Clinicians will write Dr. W. H. Nugent, Fort Worth. For any other information write the secretary.

C. M. McCauley, *Pres.*, Dallas.
W. O. Talbot, *Sec'y-Treas.*, Fort Worth.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

The forty-seventh annual meeting of the Dental Society of the State of New York will be held at Albany, N. Y., Thursday, Friday, and Saturday, May 13, 14, and 15, 1915.

The Executive Council will meet at the Hotel Ten Eyck, Wednesday afternoon, May 12th, at 3 P.M., for the transaction of business.

The first regular session of the society will open on Thursday at 10.30 A.M. The literary program will be rendered in the auditorium of the Educational Building. Headquarters for Officers and Executive Council will be at the Hotel Ten Eyck.

The clinics and exhibits will be at the Hotel Ten Eyck. Exhibitors are cordially invited to visit this meeting, and requested to make early reservations for space. Address Dr. O. J. Gross, Schenectady, N. Y., for space.

A cordial invitation is extended to all ethical dentists in New York and sister states.

A. P. Burkhart, *Sec'y*,
52 Genesee st., Auburn, N. Y.

MISSOURI STATE DENTAL ASSOCIATION.

The Golden Jubilee meeting of the Missouri State Dental Association to be held at Jefferson City, Mo., has been postponed until June 10, 11, and 12, 1915. Elaborate preparations are being made to celebrate the semi-centennial meeting of this association on an elaborate scale. Special announcement later. For information address

S. C. A. Rubey, *Sec'y*,
1017 New York Life Bldg., Kansas City, Mo.

ARKANSAS STATE DENTAL ASSOCIATION.

The Arkansas State Dental Association will hold its annual meeting at Hotel Marion, Little Rock, on May 13, 14, 15, 1915. We earnestly urge all members to be present, as we have to elect the Dental Examining Board as per our new dental law, which has just gone into effect. We cordially invite members of other societies to meet with us. A very interesting and instructive program has been arranged, and the exhibits will be better this year than ever before.

Wm. B. Dormon, *Sec'y*,
Nashville, Tenn.

MINNESOTA STATE DENTAL ASSOCIATION.

The thirty-second annual convention of the Minnesota State Dental Association will be held in Minneapolis, Minn., June 11 and 12, 1915.

Max E. Ernst, *Sec'y*,
St. Paul, Minn.

FLORIDA STATE DENTAL SOCIETY.

The Florida State Dental Society will hold its annual meeting on June 9, 10, and 11, 1915, at Passagrille, Fla.

All ethical dentists are cordially invited.

Alice P. Butler, *Corr. Sec'y*,
Gainesville, Fla.

MAINE DENTAL SOCIETY.

The fiftieth anniversary meeting of the Maine Dental Society will be held in the Lafayette Hotel, Portland, Me., on June 28, 29, and 30, 1915.

I. E. Pendleton, *Sec'y*,
Lewiston, Me.

NORTH CAROLINA DENTAL SOCIETY.

The next annual meeting of the North Carolina Dental Society will be held at Wrightsville Beach, June 23, 24, and 25, 1915.

R. M. Squires, *Sec'y*,
Wake Forest, N. C.

NEW HAMPSHIRE DENTAL SOCIETY.

The next meeting of the New Hampshire Dental Society will be held at the New Hotel Weirs, Weirs, N. H., June 22, 23, and 24, 1915.

C. S. Copeland, *President*,
L. I. Moulton, *Sec'y*.

KENTUCKY STATE DENTAL ASSOCIATION.

The Kentucky State Dental Association will hold its forty-sixth annual meeting at Ashland, June 8, 9, and 10, 1915. The program will be carried out on the progressive clinic order. All reputable dentists are invited to attend.

Chas. R. Shacklette, *Sec'y*,
Louisville, Ky.

PENNSYLVANIA STATE DENTAL SOCIETY.

The forty-seventh annual meeting of the Pennsylvania State Dental Society will be held in Reading, Pa., June 22 to 24, 1915.

Luther M. Weaver, *Sec'y*,
Philadelphia, Pa.

LOUISIANA STATE DENTAL SOCIETY.

The next Louisiana State Dental Society meeting will be held in New Orleans, La., June 3, 4, and 5, 1915, at the Grunewald Hotel.

P. W. Trowbridge, *Sec'y*.

TENNESSEE STATE DENTAL ASSOCIATION.

The forty-eighth annual meeting of the Tennessee State Dental Association will be held in Sewanee, Tenn., June 24, 25, and 26, 1915.

C. O. Rhea, *Sec'y*,
Nashville, Tenn.

NEW JERSEY STATE DENTAL SOCIETY.

The forty-fifth annual convention of the New Jersey State Dental Society will be held at Asbury Park on July 21, 22, 23, and 24, 1915.

The headquarters will be located at the Coleman House. The ballroom will be used for all meetings of the society. The glass-inclosed Casino over the ocean, just across the ocean drive from the Coleman House, has been secured for the exhibits and clinics. With over 2000 more square feet of floor-space than the pavilion used last year there should be adequate room.

Dr. Chauncey F. Egel of Westfield, N. J., is chairman of the Exhibit Committee, and reports that applications are already being made for space. Dr. W. W. Hodges of Perth Amboy is arranging for an attractive list of clinics. The Essay Committee, under the chairmanship of Dr. James I. Woolverton of Trenton, will have three essayists of prominence to present.

A cordial invitation to attend is extended to all ethical practitioners.

John C. Forsyth, *Sec'y*,
430 E. State st., Trenton, N. J.

MARYLAND BOARD OF EXAMINERS.

THE Maryland Board of Dental Examiners will meet for examination of candidates for certificates May 27 and 28, 1915, at the Dental Department of the University of Maryland, Baltimore, at 9 A.M.

For application blanks and further information, apply to

F. F. DREW, *Sec'y*,
701 N. Howard st., Baltimore, Md.

DISTRICT OF COLUMBIA BOARD OF EXAMINERS.

THE next examination of applicants for license to practice will be held at Georgetown University, June 7, 8, 9, and 10, 1915. Applications should be in the hands of the secretary two weeks before the date of examination. Fee $10.

STARR PARSONS, *Sec'y*,
1309 "L" st., N. W., Washington, D. C.

VIRGINIA BOARD OF EXAMINERS.

THE regular annual meeting of the Virginia State Board of Dental Examiners, for the examination of applicants to practice dentistry in the State of Virginia, will be held in the city of Richmond, Va., June 8, 1915, commencing at 9 A.M.

For further particulars apply to

J. P. STIFF, *Sec'y*, Fredericksburg, Va.

PENNSYLVANIA BOARD OF EXAMINERS.

THE next regular examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, Philadelphia, and the College of Pharmacy Building, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, June 9, 10, 11, and 12, 1915. The examination in practical work will be held on Wednesday, June 9, at 1 P.M. at the Evans Dental Institute in Philadelphia, and at the University of Pittsburgh Dental College in Pittsburgh.

Application papers can be secured from the department of Public Instruction, Harrisburg. Any further information can be secured from

ALEXANDER H. REYNOLDS, *Sec'y*,
4630 Chester ave., Philadelphia.

IOWA BOARD OF EXAMINERS.

THE next meeting of the Iowa State Board of Dental Examiners for the examination of candidates for licenses will be held at Iowa City, Iowa, commencing Monday, June 7th, at 9 A.M. For application blanks and so forth, address

J. A. WEST, *Sec'y*,
417 Utica Bldg., Des Moines, Iowa.

CALIFORNIA BOARD OF EXAMINERS.

THE next meeting of the Board of Dental Examiners of California for the purpose of examining applicants for a license to practice dentistry will be held in the city of San Francisco, beginning on June 4, 1915. This examination will be followed by one to be held in the city of Los Angeles, beginning on June 18, 1915. For further particulars, address

C. A. HERRICK, *Sec'y*,
133 Geary st., San Francisco, Cal.

NEW JERSEY BOARD OF REGISTRATION.

THE State Board of Registration and Examination in Dentistry of New Jersey will hold their annual meeting and examination in the Assembly chamber, at the State-house, Trenton, N. J., on June 28, 29, and 30, 1915. License fee, $25. No interchange of license. Practical tests required: Gold filling in an approximal surface of a tooth, and one amalgam filling; also the soldering of a bridge consisting of three or more teeth, exclusive of abutments, and one Richmond crown, mounted and articulated, of gold or coin silver.

Attention is directed to the following requirement: "All applicants for a license to practice dentistry in New Jersey shall present to said board a certificate from the superintendent of public instruction showing that before entering a dental college he or she had obtained an academic education, consisting of a four years' course of study in an approved public or private high school, or the equivalent thereof." In accordance with the law, the secretary will issue application blanks only upon presentation of the required certificate from the superintendent of public instruction, Trenton, N. J.

Applications must be filed complete ten

days before the date of the examination. Address all communications for further particulars to the acting secretary.

ADVANCE NOTICE.

At the meeting of the State Board of Registration and Examination in Dentistry to be held at the State-house, Trenton, N. J., December 6, 7, 8 and 9, 1915, the following practical tests will be required: Insertion of an approximal gold filling, compound approximal amalgam filling, and a silicate filling, besides a practical test of the applicant's ability in oral prophylaxis. Also preparation of a cavity for an inlay with wax pattern. Prosthetic dentistry: Five-piece bridge and Richmond crown in addition to an anatomical articulation of a full upper and lower set of teeth. Teeth to be furnished by applicant. Wax bites properly trimmed and in place on models for inspection before setting up teeth. In addition, dental jurisprudence and bacteriology will be added to the theoretical examination.

JOHN C. FORSYTH, *Acting Sec'y.*

NEBRASKA BOARD OF EXAMINERS.

THE next meeting of the Nebraska Board of Dental Examiners will be held at Lincoln, Nebr., beginning at 9 A.M., Wednesday June 9, 1915.

All applications must be in the hands of the secretary not later than June 1, 1915. Application blanks may be obtained by addressing

J. H. WALLACE, *Sec'y,*
212 Brown Block, Omaha.

WISCONSIN BOARD OF EXAMINERS.

THE Wisconsin State Board of Dental Examiners will convene in Milwaukee, at Marquette University, on June 21, 1915, at 2 P.M., for examination of applicants.

High-school diploma, application, and $25 fee to be filed with the secretary ten days prior to above date. Dental diploma to be presented in advance of the examination.

Junior dental students presenting a clear card for two years' unconditional work from a reputable dental college and filing a high-school diploma, or its full equivalent, will be permitted to participate in the theory examination in the following six major subjects: Anatomy, physiology, histology, chemistry, bacteriology, materia medica. Satisfactory grades made in these subjects will be credited at subsequent examinations.

Special application blanks for this examination and $10 fee, together with high-school credits, to be filed ten days in advance.

S. H. CHASE, *President,*
W. T. HARDY, *Sec'y,*
1404 Majestic Bldg., Milwaukee, Wis.

ILLINOIS BOARD OF EXAMINERS.

THE next annual meeting of the Illinois State Board of Dental Examiners will be held at the Northwestern University Dental School, Chicago, Ill., commencing June 10, 1915.

For application blanks, rules, and regulations, etc., apply to

O. H. SEIFERT, *Sec'y,*
Springfield, Ill.

WEST VIRGINIA BOARD OF EXAMINERS.

THE next regular meeting of the West Virginia State Board of Dental Examiners for the examination of applicants who wish to begin the practice of dentistry in the State of West Virginia will be held in the city of Charleston, beginning at 9 o'clock A.M., on June 9, 1915. For further information and application blanks, address

H. H. SMALLRIDGE, *Sec'y,*
Charleston, W. Va.

OKLAHOMA BOARD OF EXAMINERS.

THE Oklahoma State Board of Dental Examiners will hold its next regular meeting at Oklahoma City, commencing on Monday morning June 14, 1915. Candidates will be examined both theoretically and practically. The practical part of the examination will require one gold filling, one amalgam approximal filling, one gold crown or Richmond crown or both. A full upper and lower plaster model, mounted on articulator, and teeth must be mounted, articulated, waxed, and ready for flasking. Only graduates of recognized schools are eligible to take this examination.

EMMETT E. HEFLIN, *Sec'y,*
Oklahoma City, Okla.

INDIANA BOARD OF EXAMINERS.

The next meeting of the Indiana State Board of Dental Examiners will be held at the State-house, Indianapolis, commencing June 14, 1915, and continuing six days.

For application blanks and full particulars address

Fred J. Prow, *Sec'y*,
Bloomington, Ind.

MICHIGAN BOARD OF EXAMINERS.

The next regular meeting of the Michigan State Board of Dental Examiners, for the examination of applicants who wish to practice dentistry in Michigan, will be held in the dental college at Ann Arbor, beginning Monday, June 14, 1915, at 8 A.M., and continuing through Saturday, June 19th.

For application blanks and full information apply to

A. W. Haidle, *Sec'y*, Negaunee, Mich.

NEW HAMPSHIRE BOARD OF REGISTRATION.

The annual meeting of the New Hampshire Board of Registration in Dentistry, for examinations, will be held June 14, 15, and 16, 1915, at Masonic Banquet Hall, Manchester, N. H.

For application blanks or further information address

Harry L. Watson, *Sec'y*,
913 Elm st., Manchester, N. H.

TEXAS BOARD OF EXAMINERS.

The next regular meeting of the Texas State Board of Dental Examiners for the examination of applicants for license to practice dentistry in the State of Texas will be held in the high school building, Dallas, Texas, beginning June 21, 1915, at 9 A.M.

No interchange of licenses with other states. No diplomas recognized. Rules governing examinations and official application blanks will be sent upon request.

All parties desiring to take this examination should send their application, accompanied by fee of $25, to the secretary not later than June 15th.

For further information address

C. M. McCauley, *Sec'y*,
434 Wilson Bldg., Dallas, Texas.

NORTH CAROLINA BOARD OF EXAMINERS.

The next regular meeting of the North Carolina State Board of Dental Examiners will be held at Wrightsville Beach, Wilmington, N. C., beginning promptly at nine o'clock on Monday morning, June 21, 1915. Full information and application blanks may be secured by addressing

F. L. Hunt, *Sec'y*, Asheville, N. C.

VERMONT BOARD OF EXAMINERS.

The next meeting of the Vermont Board of Dental Examiners, for the examination of candidates to practice in Vermont, will be held at the State-house, Montpelier, commencing at 2 P.M., on June 28, 1915, and continuing for three days.

To be eligible for examination a candidate —(1) must be twenty-one years of age, (2) must be a graduate of a high school of the first class, and (3) must be a graduate of a reputable dental college. Applications must be in the hands of the secretary not later than June 20th.

For further information apply to

George F. Cheney, *Sec'y*,
St. Johnsbury, Vt.

SOUTH CAROLINA BOARD OF EXAMINERS.

The next annual meeting of the South Carolina State Board of Dental Examiners will be held at Columbia, S. C., beginning at 9 A.M., Tuesday, June 15, 1915.

All applications must be in the hands of the secretary not later than June 5th. Application blanks and instructions from the secretary.

Instructions for applicants. The attention of applicants is respectfully called to the following rules and regulations: (1) All applications must be in the hands of the secretary ten days before the meeting of the State Board of Dental Examiners. (2) Each application must be accompanied by a fee of fifteen dollars. (3) Each application must be recommended by three ethical dentists from the applicant's home town or nearest towns. (4) Each application must be accompanied by a photograph of the applicant, on the back of which photograph must appear the

signatures of the three dentists who recommend the application. (5) The minimum preliminary educational requirement is a state high-school diploma or its equivalent—14 units. (6) Each applicant must present a diploma from a reputable dental college. (7) The practical work in operative dentistry will consist of one gold foil filling, one silicate filling, and one amalgam filling—applicant to furnish instruments and material. Probably with an extraction and pulp removal. (8) The practical work in prosthetic dentistry will consist of full upper and lower set of vulcanite teeth articulated in wax. Applicant must furnish full upper and lower models on an articulator, also teeth and wax. The work to be done in the presence of the board. (9) The practical work in crown and bridge will consist of a four-tooth bridge from first bicuspid to second molar, inclusive. This bridge to be constructed in the presence of the Board of Examiners. Applicant will furnish articulated model, material and instruments. The board will furnish blowpipe and investment material. (10) The theoretical examination will consist of a written examination on all regular college branches.

R. L. SPENCER, *Sec'y*, Bennettsville, S. C.

MAINE BOARD OF EXAMINERS.

THE Maine Board of Dental Examiners will meet in the State-house, Augusta, Me., July 1, 2, and 3, 1915.

I. E. PENDLETON, *Sec'y*,
Lewiston, Me.

MONTANA BOARD OF EXAMINERS.

THE Montana State Board of Dental Examiners will hold a session for examination at Helena, Mont., on July 12, 13, 14, and 15, 1915.

G. A. CHEVIGNY, *Sec'y*,
Butte, Mont.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING MARCH 1915.

March 2.

No. 1,130,242, to DEXTER S. BACON. Appliance for regulating teeth.

March 9.

No. 1,130,716, to HENRY G. DRESSEL. Dental tool.

No. 1,130,892, to JOHN G. DETTINGER. Artificial tooth.

No. 1,130,974, to FREDERICK C. HINMAN. Casting apparatus.

March 16.

No. 1,131,863, to HELENE H. PHILLIPS. Toothbrush.

No. 1,132,326, to JOSEPH F. FOWYER. Toothbrush.

No. 47,100, to CHARLES BOCCIA. Toothbrush.

March 23.

No. 1,132,565, to THOMAS D. CRAIG. Dental instrument.

No. 1,133,250, to WM. M. RUTHRAUFF. Dentifrice.

March 30.

No. 1,133,379, to JEPTHA G. HOLLINGSWORTH. Dental matrix for approximal fillings.

No. 1,133,409, to SILAS E. SMITH. Dental mandrel.

No. 1,133,434, to BYRON E. ELDRED. Artificial tooth and process of making same.

No. 1,133,570, to JOHN S. NAULDER. Retainer for dental plates.

No. 1,133,930, to CHARLES E. CARROLL. Toothbrush.

No. 1,134,017, to MASTIN E. SANDERS. Dental bite tray.

THE

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ORIGINAL COMMUNICATIONS.

RECENT DISCOVERIES CONCERNING THE ETIOLOGY AND TREATMENT OF PYORRHEA ALVEOLARIS.

By FRANCIS E. STEWART, Ph.G., M.D., Philadelphia, Pa.,
PROFESSOR OF MATERIA MEDICA, DEPARTMENT OF PHARMACY AND CHEMISTRY, MEDICO-CHIRURGICAL COLLEGE, PHILADELPHIA.

(Read before the Virginia State Dental Society, April 16, 1915.)

Oral Sepsis as a Cause of Systemic Disease.

FAULTY mastication due to imperfect teeth, resulting in digestive disturbances and malnutrition, was regarded as a source of ill health long before Hunter published in the *British Medical Journal* (1900) his epoch-making paper entitled "Oral Sepsis as a Cause of Disease." Hunter called attention to the fact, now well recognized by the medical profession, "That it is not the absence of teeth, but the presence of sepsis; that it is not dental defects, but septic defects; that it is not defective mastication, but the effective sepsis associated with such dental defects, or often present in conditions of gingivitis apart from such defects—that are responsible for the ill health associated with bad mouths."

Hunter's observations have been confirmed again and again by competent physicians and skilled bacteriologists. Osler, Cummins, Murphy, Knopf, Collier, Billings, Rosenow, Mayo, Collins, Eyre and Payne, and many other authorities, lay stress upon the danger to the general health from septic conditions of the oral cavity.

THE AMERICAN MEDICAL ASSOCIATION CONSIDERS THE SUBJECT.

In a symposium on "Mouth Infections as a Source of Systemic Disease," held at the meeting of the American Medical Association at Atlantic City, in 1914, Dr. Frank Billings said that "Alveolar focal infection may be the dominant factor in the production of systemic disease, of which malignant endocarditis, chronic arthritis, and myositis are examples." E. C. Rosenow said that "Infections of the mouth are so common in patients suffering from arthritis, neuritis, appendicitis, ulcer of the stomach, goiter, etc., that their direct etiological

rôle can scarcely be questioned." C. H. Mayo said, "Root abscesses and pus pockets are often the source of acute and chronic rheumatism." Other well-known physicians took part in the discussion, and were equally emphatic in attributing many systemic diseases to a septic mouth.

As a result of these investigations, it is now generally accepted that a septic mouth may be the cause of affections of the eye, ear, throat, bronchial tubes, lungs, heart, liver, kidneys, pelvic organs, joints, and bloodvessels; and, what is equally important, that systemic diseases lower the resistance of the tissues and predispose to oral infection.

MICROBIC CAUSES OF PYORRHEA ALVEOLARIS.

Bacteriologists have made studies in order to determine the kinds of micro-organisms causing pyorrhea alveolaris, and their findings are attracting much attention, owing to the relation between cause and treatment.

BACTERIA AS AN ETIOLOGICAL FACTOR.

Miller (1890) published the first work of importance on the subject, entitled "Micro-organisms of the Human Mouth." Goadby was the next distinguished investigator in the field. In 1907 he gave the Erasmus Wilson lecture, in which he called especial attention to oral sepsis as a cause of systemic disease. The next important contributions were made by Eyre and Payne and published in the 1909 Proceedings of the Royal Society of Medicine. The contributions of Mayo, Beebe, Whittle, Best, Sims, Williams, Logan, Medalia, Leary, Cummins, and other investigators added interest to the subject.

One of the most important contributions to our knowledge of the bacteriology of mouth infection is that of Dr. Claude P. Brown, working in the Mulford laboratories in co-operation with Dr. A. P. Hitchens. The material for bacterial examination was collected by Dr. Joseph Head of Philadelphia, from pyorrheal pockets in the mouths of patients under treatment for pyorrhea alveolaris or Riggs' disease. Brown's paper was published in the *New York Medical Journal* for December 20, 1913. The several organisms were found the following number of times: Staphylococcus aureus, 6; staphylococcus albus, 9; sarcina, 3; micrococcus tetragenus, 9; Gram negative cocci, 49; Gram negative bacilli, 17; bacillus influenzæ (group) 19; streptococcus (non-hemolytic), 28; streptococcus (hemolytic), 30; streptococcus viridans, 23; pneumococcus, 27; diplococci, 13; diphtheroid, 13; yeast, 1; leptothrix, 3; bacillus, 1.

Brown's findings are confirmatory in their relation to the researches of his predecessors, in that he found the same micro-organisms present in the pyorrhea pockets discovered by them in the mouth and in the pockets of infection. All authorities now agree that any one or more of these "mouth bacteria" may infect the tissues and play a part in the etiology of the disease. The question as to the character of the original offender and the question as to the primary cause of pyorrhea alveolaris are still under discussion. It is not the object of this paper to answer either of these questions. The object is to present the latest information regarding etiology and treatment.

PROTOZOA OF THE MOUTH A CAUSE OF PYORRHEA ALVEOLARIS.

Renewed interest concerning the microbic origin of pyorrhea alveolaris was excited by a paper by Dr. M. T. Barrett, read before the Pennsylvania Dental Society at its annual meeting held in Philadelphia, July 1, 1914, and published in the DENTAL COSMOS for August of the same year.

The paper was a preliminary report of work prosecuted by the author in collaboration with Allen J. Smith, professor of pathology in the School of Medicine of the University of Pennsylvania. It is entitled "The Protozoa of the Mouth in Relation to Pyorrhea Alveolaris," and announces the discovery of

amœba buccalis as the principal etiological factor of Riggs' disease. It has long been known that protozoa, like bacteria, may live in the mouth and do no harm. It is only when they become parasites and live at the expense of the tissues that their presence is especially harmful.

Dr. C. C. Bass and Dr. F. M. Johns, Tulane University College of Medicine, confirmed the findings of Barrett and Smith. Their papers appear in the *New Orleans Medical and Surgical Journal,* November 1914, and in the *Journal of the American Medical Association,* Feb. 13, 1915. (See Cosmos, January, page 102.)

THE SAME PROTOZOA FOUND IN THE TONSILS.

An important paper relating to amœbic infection was presented before the Philadelphia Pathological Society in the early part of October 1914, by Smith, Middleton, and Barrett, and published in the *Journal of the American Medical Association,* November 14, 1914. In this paper the authors announce their discovery of the same endamœbæ in the tonsils—observed in cases of chronic hypertrophic tonsillitis—as were previously observed by Barrett and Smith in infected mouth tissues. Emphasis was given in this paper to the probable relationship between amœbic infection occurring in the mouth and tonsils with various systemic complications such as arthritis, obscure anemias, and gastro-intestinal diseases.

DEDUCTIONS.

The deductions from these researches are as follows:

(1) Oral sepsis is a mixed infection.

(2) The micro-organisms taking part in the infection are of two kinds, namely, protozoa and bacteria.

(3) These micro-organisms live with us as commensals or messmates, subsisting upon particles of food, cast-off epithelium, etc., therefore usually manifest a saprophytic existence.

(4) Whenever the vitality of the tissues is lower than the potency of the enzymes or digestive ferments produced by these microbes, or a microbe of unusual virulence finds its way into the mouth, infection results.

(5) The infection once started is liable to extend, resulting in the establishment of foci in other parts of the body, and consequent systemic diseases. Some observers claim that the tonsil is where microbes learn to become parasitic. This claim is especially interesting in connection with the observations of Smith, Middleton, and Barrett, who found endamœbæ in the tonsils, and reported to the Philadelphia Pathological Society as aforesaid.

(6) Systemic diseases predispose to mouth infection by lowering tissue resistance to microbic life in the oral cavity.

Treatment of Pyorrhea Alveolaris.

In relation to treatment, the objects are—(1) Destruction of infecting micro-organisms. (2) Prevention of reinfection. (3) Treatment of systemic diseases as indicated.

THE USE OF AMŒBACIDES AND BACTERICIDES.

For the destruction of infecting micro-organisms, amœbacides and bactericides are indicated. Thus far, ipecac or the hydrochlorid of its alkaloid, emetin, heads the list. However, quinin may be employed, or chaparro amargosa. Tincture of iodin may be used as a bactericide, but ammonium fluorid, in 20 per cent. solution containing 10 per cent free hydrofluoric acid, as recommended by Head of Philadelphia, is preferred by many.

THE USE OF IPECAC AND EMETIN HYDROCHLORID.

The first step in treatment should be the use of emetin hydrochlorid in one-half of one per cent. solution in the manner recommended by Barrett and Smith. The solution should be injected into the pockets of the infection and

applied to the interdental spaces and around fixed appliances. Treatment should be repeated daily for at least five days, and thereafter every other day, until about ten treatments have been given.

Bass recommends rinsing the mouth thoroughly with a solution of fluid extract of ipecac—two or three drops to a half-tumbler of water—which he believes protects against reinfection and actually cures the disease in its early stages.

A valuable mouth-wash containing ipecac, to be used as a preventive of reinfection and as a cure for pyorrhea alveolaris, may be prepared to meet the suggestion of Bass by combining in each fluidounce the following ingredients:

Fluid extract of ipecac,		48 min.
Zinc chlorid,		2 gr.
Beta-naphthol,		1/2 "
Sol. formaldehyd (40 p. c.),		1/3 min.
Menthol,		1/8 gr.
Oil of gaultheria, Alcohol, 55 per cent.,	q. s. ad	1 fl. oz.

Bass states that the demonstrable endamœbas are destroyed by one-half grain doses of emetin hydrochlorid administered for from six to eight days. Bass recommends the drug hypodermically or intramuscularly in doses of one-fourth to one grain.

The destruction of the endamœbæ may result in the cure of the patient's condition, yet the bacterial infection may continue, not only requiring the local use of bactericides but the employment of bacterin therapy.

USE OF AMMONIUM BIFLUORID.

According to Head, one of the best bactericides for use in the treatment of pyorrhea alveolaris is a 20 per cent. solution of bifluorid of ammonium, with 10 per cent. free hydrofluoric acid. Head says that this solution is not only very effectual as a bactericide, but it also is an excellent solvent for the softening of tartar. It is commonly believed that the accumulation of tartar aids in separating the gums from the teeth, and in the production of pockets of infection. To what extent the tartar accumulation is an etiological factor in pyorrhea is possibly an open question. However, there can be no question that it should be removed by the dentist. Head says that the ammonium bifluorid solution not only destroys the bacteria and softens the tartar so that it may readily be removed by the scalers, but stimulates the tissue cells so that they form a reattachment of the gum to the root, thus causing the disappearance of the pockets of infection, and getting rid of the self-perpetuating foci of infection. After four or five applications one week apart, black scales that have escaped the instrument will sometimes be found floating loose in the pockets of infection, so that they can be readily picked out, and finally the root will become as soft as velvet to the touch of the instrument.

Dr. Head says that when this stage has been reached it will be found that the scalers cannot be carried as deeply into the pyorrhea pockets as in the beginning. To do so causes pain and a free flow of blood. This indicates that new granulations are forming, and these should not be ruthlessly broken up either by instrumentation or by the injection of bifluorid into them. If at the end of two or three months of treatment any of the pockets of infection have not entirely healed, they should be re-explored with scalers, and the treatment repeated as for a new case. Teeth that have lost more than half of their gum attachment under this treatment have become firm and comfortable to the action of normal mastication.

BACTERIN THERAPY.

The objects of bacterin therapy are—(1) To aid nature in eliminating disease-producing bacteria from the tissues, after they have become established; (2) to prevent disease-producing germs from gaining a foothold in the body.

SELECTING A BACTERIN.

In selecting a bacterin, several factors are to be considered. At one time it

was considered necessary to ascertain the original offender, and prepare a bacterin from that organism only. The opsonic index was used for its identification, also for guiding the physician afterward in regard to dosage. This plan was finally abandoned on account of its impracticability, also because it was found unnecessary; furthermore, it soon became apparent that most of the diseases caused by microbic invasion sooner or later become mixed infections. Then it was conceded that more than one organism should be employed in preparing a bacterin, but that the mixture should be autogenous, *i.e.* prepared from the pathogenic micro-organisms actually existing in the mouth of the patient. To support this claim, the doctrine of specificity was cited. While it is probably true that in streptococcic infections autogenous bacterins are preferable to stock bacterins on account of the numerous strains of streptococci existing, yet it is equally true that regarding many kinds of infecting bacteria, this objection does not maintain, because large varieties of strains do not exist.

The views of some of those who advocate the exclusive use of autogenous bacterins are extreme, as proved by the wonderful results attending vaccination against smallpox, rabies, and typhoid fever, and the employment of diphtheria antitoxin, tetanus antitoxin, and antibacterial serums, for prophylaxis or treatment.

Researches by George H. Smith conducted in the Mulford laboratories demonstrated the presence of specific antibodies for each type in the serum of animals immunized with a number of varieties of bacteria, proving that the use of a properly mixed bacterin is in harmony with scientific requirements.

ADVANTAGES OF SENSITIZED BACTERIN.

The next factor to be considered is the choice between non-sensitized and sensitized bacterin. In the former normal saline solution is employed, and it is standardized to contain a definite number of micro-organisms.

Sensitized bacterin is prepared by macerating the disease-producing bacteria in immune serum, *i.e.* serum from animals immunized against the disease for which the bacterin is to be prepared. The amboceptor in the immune serum unites with the bacterial protein, and prepares it for the immediate action of its complement contained in the patient's blood. An adequate immunizing response follows its ingestion within twenty-four hours.

As stated by Garbat, the injection of an ordinary bacterin aims at nothing more than what the body is already doing, namely, the production of antibodies for the breaking-up of the bacteria. When the body cells are inactive, the use of ordinary bacterins stimulate the body cells to activity and the production of antibodies. During an infection the tissue cells are less responsive than during health, especially if the disease be a severe and prolonged one. That is why an efficient serum (passive immunity) would be the ideal form of specific therapy. Sensitized bacterins (serobacterins) possibly hold a position between serum therapy and ordinary bacterin treatment. In the first place, they might save the system from the strain of producing the primary antibodies for the destruction of the bacteria, and second, this provision might hasten the stage of liberation of the endotoxins and stimulation of the anti-endotoxins, an important step in the recovery from the disease.

Furthermore, according to Besredka, the immunizing response is not only more rapid when sensitized bacterins are employed than that obtained from ordinary bacterins, but also there is less liability to unpleasant reaction.

By means of the Abderhalden test, Smith examined the serums of rabbits immunized with sensitized and non-sensitized bacteria as follows:

(1) Injections of a mixture of killed typhoid and killed paratyphoid B. Ferments for typhoid appeared in 36 hours, and for paratyphoid B in 33 hours.

(2) Injection of a mixture of killed typhoid and sensitized killed paratyphoid B.

Ferments for paratyphoid B appeared after 15 hours, and for typhoid in 36 hours.

(3) Injection of a mixture of sensitized typhoid and killed paratyphold B. Ferments for sensitized typhoid appeared in 17 hours, and for paratyphoid B after 36 hours.

(4) Injection of a mixture of sensitized killed typhoid and sensitized killed paratyphoid B. Ferments appeared for both types in 18 hours.

These results prove that sensitization accelerates, and corroborates the observations of Besredka and other authorities regarding the superiority of sensitized vaccines.

CONJOINT USE OF BACTERINS AND SENSITIZED BACTERINS.

Garbat suggests the conjoint use of sensitized bacterins and ordinary bacterins on account of the difference between them in the character of immunizing response.

The main immunizing response to an injection of ordinary bacterin is the production of bacteriolytic antibodies which digest and destroy the bacteria, while the main response to sensitized bacterins is bacteriotropic, that is opsonic, the function of the opsonins being to prepare the bacteria for ingestion and digestion by the phagocytes (phagocytosis).

TREATMENT OF PYORRHEA ALVEOLARIS BY INJECTION OF MERCURY.

"Wright and White* have treated twenty-eight consecutive cases, all of which have been completely cured in remarkably short periods. Of these, nine, or 32.1 per cent., had systemic infections in all probability secondary to pyorrhea, six of these being chronic arthritis or chronic gastritis, one chronic bilateral facial neuralgia, and one chronic laryngitis. In addition, two others had gonorrheal arthritis. All of these systemic infections, including the cases of gonorrheal arthritis, were also cured. The longest period of time required to effect a cure was forty-one days, the shortest four days; the greatest number of injections required to cure the primary infection in one case was six, the smallest number, one.

"The local treatment as administered by Wright embraces the following: Careful expressions of the pus from the pockets, thorough removal of calcarious deposits and tartar wherever found, extraction of hopeless teeth and roots, polishing of tooth structure, followed by applying to the margin of the gums equal parts of tincture of iodin, tincture of aconite, and chloroform, to be continued every other day. The injection of succinimid should be commenced with the local treatment. The initial injection in a male patient should be 3/5 grain repeated every seventh day, or depending on the condition of the patient; the dose of each succeeding injection may be slightly reduced. In females the dose should be from 1/5 to 2/5 grain less."

* "Treatment of Pyorrhea Alveolaris and Its Secondary Systemic Infection by Deep Muscular Injections of Mercury," B. L. Wright and P. G. White, U. S. Navy. (Abstract from *Med. Record*, N. Y., March 13, 1915, in *Journ. A. M. A.*, March 27, 1915.)

NEURALGIA.

By D. H. SQUIRE, Buffalo, N. Y.

(Read before the Maryland State Dental Association, at its annual meeting, Baltimore, June 11 and 12, 1914.)

NEURALGIA is a condition which indicates that the function of a nerve has been disturbed, and is characterized by pain along its course. In neuralgia of the trifacial nerve, there are no local symptoms other than a slight flushing of the face. It is a common inheritance of the debilitated and the anemic, and is also associated with gout, rheumatism, malaria, and syphilis. In many cases it is extremely difficult to find the cause and, while it may be often traced to denuded periosteum with sinus, impacted teeth, dental caries, fracture and latent necrosis of the jaws, poorly adjusted crowns, and the use of arsenic in destroying pulps, still it is the opinion of the writer that it is due most frequently to a condition superinduced by operative procedures in filling large cavities with metals, without attempting to insulate the pulp from thermal irritation.

Neuralgia is broadly classified in two forms: (*a*) Neuralgia quinti major, which presents a definite course and clinical picture, and (*b*) neuralgia minor, that form in which the pain is caused by some irritation along the course of the fifth nerve.

This is a very practical classification, as in one division the cause cannot be found, and in the other it may be found.

CENTRAL LESIONS.

In central lesions, tumors of the brain or meninges, and of the roots and trunks of nerves, often give rise to neuralgic conditions.

PERIPHERAL LESIONS.

In this class we find exposed pulps, impacted teeth, inflammatory conditions of the jaw-bones causing increased density from deposits of lime salts, resulting in pressure upon the nerve filaments; pressure on nerve trunks from growths, pyorrhea alveolaris, eyestrain, middle-ear disease, inflammation of the maxillary, sphenoidal, and frontal sinuses and of the ethmoid cells.

Neuralgia major often begins as neuralgia minor and the pain increases in frequency and severity, and a search for the cause proves fruitless. The paroxysms may come on from sudden shock, exposure to cold, or even talking. The twitching of the muscles indicates the irritation of the facial nerve as well.

In neuralgia minor, due to an obvious cause, the symptoms consist of a sharp, shooting pain along the course of the nerve, beginning at the seat of the lesion. These pains may arise without provocation, and may be confined to one or two divisions of the fifth nerve.

The right trifacial nerve is affected twice as often as the left, and according to Tiffany's report of 59 cases, 10 involved the first division, 6 the second division, 22 the third division, 14 the second and third divisions. As diagnosis is best made by exclusion, the dentist is often consulted by the medical man to ascertain if the dental organs are in a healthy condition.

THE RÔLE OF THE DENTAL PULP.

Therefore, without attempting to discuss this subject from every viewpoint, I wish to call attention to a few thoughts upon the structural changes which occur in the dental pulp, resulting from a mild irritation following an attempt to restore the form of the tooth.

The normal pulp exists in a state of equilibrium maintained by a system of nutrition on the one hand, and by an equally perfect condition of protection from irritating causes on the other. Anything which interferes with either of these conditions creates a new environment, which must be met by the law of compensation. In order to combat these new changes and to produce again a state of proper isolation, the odontoblastic layer covering the periphery of the pulp is the principal factor in reestablishing this condition.

When one appreciates the almost perfect state of balance which is maintained in the normal pulp, one realizes how inadequate are our best methods for properly protecting it from outside influences.

The normal pulp performs two functions: (1) The formation of dentin, which is a vital one; (2) it responds to chemical and traumatic and thermal irritation—sensory.

The former function is performed by the odontoblasts, while the latter involves stimulation by the sensation of pain. The pulp has no sense of touch or localization.

BLOOD SUPPLY OF THE DENTAL PULP.

Usually several arteries enter the pulp through small foramina in the apical region of the tooth, passing up through the central portion of the pulp, giving off many branches as they ascend, and finally forming a plexus of capillaries along its surface. From these capillaries the blood is collected into veins, which follow a parallel course to the arteries, and pass out through the same foramina near the end of the root. All of the bloodvessels have such delicate walls that there is very little distinction, if any, between the structure of the capillaries and that of the veins.

The first sign of irritation is noticed in the blood supply. The bloodvessels are very numerous in the pulp, and render the tissue unusually susceptible to those pathologic conditions which are associated with alterations in the circulation: First, by their arrangement; second, by the structure of their walls; and lastly, by the character of intercellular substance through which they pass. The muscular tissue is almost absent and this formation offers very little resistance, if any, toward dilatation in even the largest arteries. This condition renders the tissue very liable to hyperemia and to inflammation.

The intercellular substance of the pulp is of a semifluid nature, and gives no support whatever to the walls of the bloodvessels, and under such conditions it seems extremely difficult to avoid sensory irritation followed by vaso-motor stimulation in the reparative work upon the dentin.

NERVE SUPPLY OF THE DENTAL PULP.

The nerves enter the pulp through the foramina near the apex of the root, and branch very frequently, as they pass through its center toward its occlusal portion to reach the layer of Weil. Here they also form a plexus, from which branches are given off which pass between and around the odontoblasts, forming a plexus about each cell, and some fibers are continued to the end of the cell between it and the dentin, but they have not been traced into the dentinal tubules. The sensitiveness of the dentin is due to the number of vital fibrils connected with normal odontoblasts which are in physiological connection with the nerve fibers.

The response to pain in pathologic conditions of the pulp is due not only to irritation of the dentinal fibrillæ, but to various degrees of pressure, depending upon the amount of dilatation of the arteries.

Noyes says that—"The intensity of pain depends upon the irritability of the cytoplasm of the fibrils transmitted through the continuity of the cytoplasm to the odontoblasts, and then through their reaction upon the nerve fibers of the pulp. For instance, the irritation of the cytoplasm of the fibrils may excite changes in the cytoplasm of the odontoblasts. These react upon the cytoplasm

of the nerve fiber, and so are transmitted to nerve centers and are recognized as the sensation of pain."

It is therefore assumed, from the knowledge which we possess in regard to the blood and nerve supply of the pulp, that the first pathologic change is manifested here. The loss of normal covering of the pulp, whether it be due to erosion, abrasion, caries, or a restoration, will produce sensation resulting in vasto-motor stimulation, which is followed by irritation, stimulation, overstimulation, and finally paralysis of the circulatory and nervous system. This change in turn will cause degeneration and death of the pulp.

Following the placement of large metallic masses, in the form either of fillings or crowns, in close proximity to the pulp, a decided change in the environment of this tissue takes place. The metals which are used in dentistry are good conductors of thermal changes and electricity, and through the agency of these filling materials a mild irritation of the pulp is set up. Black has pointed out that it is not the acute conditions which cause the obscure cases of neuralgia, but rather the mild, continuous irritations which induce structural changes in the pulp tissue.

There are several pathologic conditions directly due to or greatly augmented by such methods of dental practice, namely, tubular calcification, secondary dentin, pulp nodules, and calcarious degeneration of the entire pulp.

Tubular calcification is regarded by some authors as the effect of a physiological process, and acts as a protection to the pulp in increasing its insulation, and as a barrier against the progress of dental caries, mechanical wear, etc. This process begins as soon as the enamel is removed from the dentin, and to some degree is associated with gout and rheumatism.

SECONDARY DENTIN.

After the pulp has had a period of rest from functional activity, it may be stimulated by the irritation of thermal shock to again perform its function. The causes of stimulation are age, presence of large metallic fillings, abraded or eroded surfaces, gold crowns upon vital roots, and the use of zinc oxychlorid in moderately deep cavities and in the capping of pulps. The secondary deposit of dentin usually takes place opposite the area of the irritation; the deposit continues along the whole side of the tooth, and the tubules are quite normal in number and regular in distribution. Black has found that they become fewer, and that the dentin finally becomes amorphous in structure.

The pulp may die and, becoming infected, cause pericemental irritation. In multi-rooted teeth, the deposits occur in the root-canals and cause obstructions which are very difficult to remove; furthermore, we may find the pulp in one root dead and degenerating, while in the others it is partially alive. In other cases we have deposits of secondary dentin extending well into the canal, totally obliterating it for a considerable depth, and in such cases thermal tests for ascertaining the vitality of the pulp are not conclusive.

PULP NODULES.

These masses of calcific material occupy a position within the pulp tissue. They are found in teeth which have suffered from abrasion, erosion, and slow processes of decay, and according to Black, these nodules occur in teeth of the same jaw which are not directly involved in the irritation. Whatever be their origin, cell secretion or something else, they increase gradually in size, and many times exert pressure upon the nerve filaments, which results in irritation.

CALCIFIC DEGENERATION OF THE PULP.

This condition is produced by the infiltration of inorganic matter derived from the lymph into tissue which is either dead or undergoing degeneration. Calcific degeneration occurs in a semi-stagnant current of blood. The presence of excess of carbon dioxid causes an

acid reaction, and, owing to a faulty supply of nourishment and the waste products not being normally eliminated, the albuminous matter of the tissue undergoes degenerative changes.

The cells and their constituents have some affinity for inorganic salts which are taken up from the lymph, and gradually the tissue becomes infiltrated. This condition is usually brought about by lack of vitality in the pulp, and it is caused by an over-production of secondary dentin, or by a chronic inflammation which has existed for a long time.

The calcific material envelops the anatomic structure of the pulp in a mass. The calcification in root-canals may be either tubular or cylindrical, and the nature of the mass conforms with the size and length of the fibers. When such pulps are removed after devitalization, they come away intact, having completely lost their odontoblastic attachment to the dentin.

From this very superficial *résumé* of the results of mild, prolonged irritation of the dental pulp, it is apparent that much could be done toward the preventive treatment of neuralgia minor and perhaps major.

DIAGNOSIS OF NEURALGIA. THERMAL TESTS.

In diagnosing neuralgia, the sinuses should be examined by transmitted light, and a history taken of any disease which has occurred in the antral, orbital, nasal, or aural cavities. The points on the face where nerves pass over bony prominences should be observed to ascertain if the terminal branches of the nerves are sensitive. Reflex pains at distant parts should receive careful attention, followed by an examination of the mouth and the teeth.

Black says that the pulp of a healthy tooth responds to hot or cold applications indifferently. It is accustomed to temperatures from 40° to 110° F., and when healthy, it is not irritated by this change in degrees.

When the amount of dentin covering the pulp is decreased, the reaction to thermal stimuli increases as the pulp is approached, until it is immediate. Following this, there is a response to lesser degrees of temperature of about 80° or 85° F. and at 102° F. Later, instead of a contraction pain, thermal stimuli of moderate temperature cause a throbbing pain. In the course of pathologic changes, intense pain is produced by heat, and cold applications bring relief.

Again, the normally quick response to thermal stimulation is followed by a delayed reaction, and pain is only felt after continued applications of cold to the crown of the tooth.

Under such conditions, after a considerable lapse of time, there is an increased response to pain, but only after continued stimulation. Following this period, there is no response to very cold applications, indicating that the sensory function of the pulp is paralyzed.

The bloodvessels have lost their tone and become dilated through vaso-motor action, and the distention of the vessels causes a throbbing pain. Later on, the vessels are dilated on the patient's assuming a reclining position, causing the same character of pain. Stimulation by cold until the later stages are reached causes a contraction pain, as the caliber of the artery is reduced in size. When the pulp is paralyzed, heat produces further dilatation of the bloodvessels, and if gases are present from putrefactive processes, heat causes their expansion, which creates pressure upon the nerve filaments.

It is therefore assumed that, when the pulp of a tooth has lost much of its covering of enamel and dentin, its sensory and vaso-motor nerves become stimulated, over-stimulated, irritated, and finally paralyzed.

In view of the fact that the pulp is so responsive to thermal irritation and that this apparently harmless stimulation leads to formation of dentin in the pulp chamber and in the tissue itself, it is incumbent upon the general practitioner of dentistry to make use of the knowledge which he already has at hand of the exciting causes of these pathologic conditions.

We know that the typal demand of the tooth has been met when the formation of the dentin is completed. It is therefore the belief of the writer that, after the patient has attained the age of thirty-five or more years, in cases of large cavities including two or more surfaces to be filled with metals, in teeth which are prepared for abutments, in conditions of absorption of the alveolar process and of the septal tissues, and in all cases of advanced abrasion or erosion, the pulps should be extirpated. This practice does not mean wholesale pulp destruction, but it does mean a careful diagnosis of the causes which produce reflex pain and an attempt toward preventing a condition which in many cases renders life unbearable, even leading to insanity and self-destruction.

OXIDATION AND REDUCTION OF HYDROGEN DIOXID.

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IN discussing hydrogen dioxid I want to confine myself chiefly to its property of *oxidation* and *reduction,* because under this particular aspect I hope to be able to answer two important questions, which are of vital interest to us, both as chemists and as pharmacologists.

SCOPE OF THE INVESTIGATION.

The first question is: Does hydrogen dioxid go to water and oxygen *in chemical reaction* ($2H_2O_2 \rightarrow 2H_2O + O_2$)?

It is true that hydrogen dioxid *per se* can decompose into water and oxygen, just as water itself dissociates spontaneously into hydrogen and oxygen at a temperature of about 2500°C. But this is not the sense in which we wish to interpret the above question, and I have therefore purposely qualified my interrogation by saying "in chemical reaction." Even with this qualification our question still remains somewhat vague, because we omit to state under what specific condition—whether of oxidation or reduction—the above information is desired.

The second question which I propose to touch upon is a modification of the first, and may be worded as follows: Does the free oxygen which we obtain in some of the reactions (reduction) with hydrogen dioxid come, in part or entirely, from the dioxid employed? Referring to page 307, "Introduction to Inorganic Chemistry," by Alex. Smith, we read: "In all reductions by hydrogen peroxid, each molecule of the latter removes but one atomic weight of oxygen. Whether it behaves thus because its two hydrogen units combine with *this* oxygen and *all its own* oxygen escapes, or because it furnishes water and *one* oxygen unit of the pair required to form the molecule of free oxygen (the substance reduced furnishing the other), has not been determined." Professor Holleman, in his "Text-book of Inorganic Chemistry" (4th Eng. ed.), page 56, is more positive on this point, and gives the following explanation: "The ability of so powerfully oxidizing a substance as hydrogen peroxid to act also as a reducing agent can be explained as follows: One of its two oxygen atoms must be loosely joined to the molecule.

since it is easily given up. All the substances which are reduced by hydrogen peroxid also have one loosely held oxygen atom; silver oxid, potassium permanganate, ozone, and others give up their oxygen at rather low temperatures. It is therefore possible that the mutual attraction of the oxygen atoms, which tends to make them form oxygen molecules, is stronger than the force by which they are held in hydrogen peroxid, on the one hand, and the respective oxygen compound on the other." Another statement accordant with this view is given in "Qualitative Chemical Analysis," by Prescott and Johnson (page 287, 6th ed.), which reads thus: "$Mn''-^{n}$ with H_2SO_4 forms $MnSO_4$, oxygen being evolved both from the H_2O_2 and from the Mn compound." Parenthetically, I might quote from this same authority the following: "Hydrogen peroxid usually acts as a powerful oxidizing agent to the extent of one-half its oxygen." The oxidizing power of hydrogen dioxid is generally better understood, but the difficulty lies chiefly on the side of the reduction power of the same agent. Let us take a case in point and see what possible oxygen derivation is meant. The following is a familiar reaction and is used for the titration of hydrogen dioxid in quantitative analysis:

$$2KMnO_4 + 3H_2SO_4 + 5H_2O_2 = K_2SO_4 + 2MnSO_4 + 8H_2O + 5O_2 \qquad (1)$$

We observe in this equation that we have five molecules of free oxygen. According to Professor Holleman, five atoms are derived from the dioxid and five from the permanganate. In conformity with this acceptation, the five molecules of hydrogen dioxid would go to five molecules of water, with five atoms of oxygen left over. Professor Smith's view, while accepting the possibility of Professor Holleman's explanation just given, allows us, furthermore, to infer that all the five molecules of oxygen may come from the five molecules of the dioxid, leaving the ten atoms of hydrogen (resulting from the dioxid) to take up five atoms of oxygen from the permanganate to form five molecules of water. (This would leave three atoms of oxygen over in the permanganate, which, with the hydrogen of the sulfuric acid, would furnish the three additional molecules of water in the equation.)

CURRENT TEACHINGS ON THE IONIC EQUATION.

With these preliminary remarks, which outline, generally speaking, the present state of this inquiry, I will now essay my own approach to the situation. As the process of oxidation and reduction consists *essentially* in a transfer of electric charges (valencies) between the substances concerned, and as this relation is most conclusively exhibited in the ionic equation, we shall resort to this means in the succeeding development of our treatise. But let us first consider the usual teachings on the ionic equation itself. Having already touched upon this matter in my paper on Arsenic Pentoxid (DENTAL COSMOS, vol. lvi, No. 11, p. 1232) I shall first briefly repeat what I there said on the oxidation and reduction equation, and then describe more fully that which may prove to afford additional information.

Let us take, for instance, the ionic equation:

$$Hg^{\cdot\cdot} + Sn^{\cdot\cdot} \rightarrow Sn^{\cdot\cdot\cdot\cdot} + Hg^{\circ} \qquad (2)$$

This expression shows us that the two positive charges of the divalent cation ($Hg^{\cdot\cdot}$) were transferred to the stannous ion. In this reaction, stannous ion was oxidized and mercuric ion reduced. In such cases, therefore, where oxidation and reduction affect the cations, we may state: Oxidation is the same as increasing the *positive ionic charge*, and reduction the same as diminishing the *positive charge*. When, however, oxidation and reduction has reference to anions, we state our conditions in the opposite sense; oxidation then means a loss or diminution of *negative ionic charge* and reduction a gain of *negative charge*. For example, chlorin acting upon hy-

dro-iodic acid results in the formation of hydrochloric acid and free iodin:

$$Cl_2^\circ + 2H \cdot I' = 2H \cdot Cl' + I_2^\circ$$

Removing the common ions on both sides of the equation (this we can do because there is no alteration in their concentration on either side) we obtain the following ionic equation:

$$Cl_2^\circ + 2I' \rightarrow 2Cl' + I_2^\circ \qquad (3)$$

This expression tells us that neutral chlorin (Cl°) acquires a negative charge and is said to be reduced, while iodin ion (I') which loses its negative charge —thereby becoming free iodin—is oxidized. Professor Ostwald says, in elucidation of this subject: "Since the sum of a positive and a negative charge is zero, increase of the positive charge is equivalent to diminishing the negative charge (oxidation), and diminution of the positive is the same as increase of the negative ionic charge (reduction)." And he continues: "The conversion of a neutral substance"—see Cl° in equation 3—"into an ion with a negative charge is equivalent to the conversion of a positive ion"—see $Hg^{\cdot\cdot}$ in equation 2—"into the neutral state." The next equation will show a case in which both a cation and an anion is altered in its ionic value:

$$Cl_2^\circ + Sn^{\cdot\cdot} \rightarrow Sn^{\cdot\cdot\cdot\cdot} + 2Cl' \qquad (4)$$

Neutral chlorin acquires a negative charge and is reduced. Divalent tin experiencing a gain of positive charges is oxidized to a tetravalent ion. Note that the rule for deciding where oxidation and where reduction is taking place is clearly applicable to the above expression, but no substance is shown whence the charges, both positive and negative, on the right side might be derived. At first sight it might seem that there is an inequality—of ionic charges at least—which cannot obtain in an algebraic equation. But, if we recall the statement that the sum of a positive and a negative charge is equal to zero, we shall see that two positive charges of the stannic ion will cancel the two negative charges of the chlorin ion, so that our equation is, after all, correctly balanced. Professor Boettger lays down as a strict rule that in every ionic expression, if its validity is to be maintained, there must always be an equal *surplus* or *excess* of either positive or negative charges on each side of the equation. Let us review our equation in this light. Here we have two positive charges on the left side. On the right side we observe four positive charges. But we also have two negative charges on this side which will neutralize two of the four positive charges, so that a surplus of two positive charges remains, which is the same as on the left side. In equation 3 we have two negative charges on each side of the equation.

The importance of the ionic equation consists in its universality of application. While it is not concerned with the concentration of the reacting and resulting ions on either side of the equation, and therefore has no bearing upon the direction, forward or backward, of the reaction (this depending on the *action of mass*), the ionic equation tells us nothing about the individual characters, chemically, of the ions participating in the process. Thus, any one particular oxidizing agent has not the same value with regard to its every (indefinite) oxidizable substance. Likewise, no reducing agent has equal efficacy with regard to all reducible substances. The degree of oxidation and reduction, therefore, depends on the individual properties of the substances brought together. However, what the ionic equation does show *essentially* in every oxidation and reduction, is some transfer of the electric charges of the ions. Consequently, so long as we conserve this essential, we can write a partial equation in which we take account of one ion only and simply indicate the migrating charge which is given up or taken on by the other ion, which we disregard or which may be any indefinite ion capable of furnishing or taking up that migrating charge. The partial equation does not represent a chemical

reaction, but only shows the individual course of the ion under consideration. The indicated ionic charge is by no means set free, but becomes *available* only when a substance is present which can give up positive or take up negative charges. Let us take the following example:

$$Fe^{\cdot\cdot} + (^{\cdot}) \rightleftarrows Fe^{\cdot\cdot\cdot} \qquad (5)$$

This expression tells us that any diferrion ($F^{\cdot\cdot}$) plus a positive charge ($^{\cdot}$) goes to triferrion ($F^{\cdot\cdot\cdot}$), or, conversely, any triferrion in being reduced goes to diferrion plus a positive charge. Again, since increase of positive charge is equivalent to diminution of negative charge, we may write this expression in still another form:

$$Fe^{\cdot\cdot} \rightleftarrows (') + Fe^{\cdot\cdot\cdot} \qquad (6)$$

—which informs us that any diferrion goes to triferrion plus a negative charge, or, read backward, any triferrion plus a negative charge goes to ferrous ion. If we compare the last two equations, we note that we can transpose any charge to the opposite side of the equation by simply changing its sign, identically as we would treat an algebraic quantity. If we have two partial equations, one for each ion concerned in a reaction, we can perform an addition whose sum will be correct in proportion as its partials were validly constructed, as the following will illustrate:

$$Sn^{\cdot\cdot} + 2(^{\cdot}) \rightarrow Sn^{\cdot\cdot\cdot\cdot} \qquad \text{(The oxidation partial.)}$$
$$Hg^{\cdot\cdot} \rightarrow 2(^{\cdot}) + Hg^{\circ} \qquad \text{(The reduction partial.)}$$
$$Hg^{\cdot\cdot} + Sn^{\cdot\cdot} \rightarrow Sn^{\cdot\cdot\cdot\cdot} + Hg^{\circ} \qquad \text{(The sum, or complete ionic equation.)}$$

The ionic charges, $2(^{\cdot})$, appearing on opposite sides in the respective equations, cancel out. The partial equation is especially desirable in cases of complex ions where its real utility becomes manifest, as may be shown by the following example: Suppose we have the two ions MnO_4' and NO_2', a permanganate and a nitrite, the first to be reduced, and the second to be oxidized. For the permanganate, we proceed thus: The manganese (Mn) in MnO_4' is a septad; after reduction, it will be, say, a diad, and five positive charges must be given up. As far, then, as the manganese is concerned, we say

$$MnO_4' \rightarrow Mn^{\cdot\cdot} + 5(^{\cdot}) \qquad (6)$$

But we have still to dispose of the oxygen in MnO_4'. To take up the four atoms of oxygen, we need eight hydrions ($8H^{\cdot}$), which, in taking up that oxygen, gives four molecules of water. Embodying this disposition of oxygen in our equation, we obtain

$$MnO_4' + 8H^{\cdot} \rightarrow 5(^{\cdot}) + Mn^{\cdot\cdot} + 4H_2O \qquad (7)$$

—or, transposing the charge,

$$MnO_4 + 8H^{\cdot} + 5(') \rightarrow Mn^{\cdot\cdot} + 4H_2O \qquad (7a)$$

With regard to the nitrite (NO_2'), we submit the following: In the first place, NO_2' goes to a nitrate (NO_3'). To furnish the additional oxygen, we add the equivalent of water:

$$NO_2' + H_2O \rightarrow NO_3' + 2H^{\cdot}$$

This gives us two hydrions on the right side. But there must always be an equal surplus of positive or negative charge on each side of the equation. Hence we unite two positive charges, $2(^{\cdot})$, on the left side, opposite to that of the hydrions:

$$NO_2' + H_2O + 2(^{\cdot}) \rightarrow NO_3' + 2H^{\cdot} \qquad (8)$$

—or, transposing the charges,

$$NO_2 + H_2O \rightarrow 2(') + NO_3 + 2H^{\cdot} \qquad (8a)$$

We now have two partial equations, 7 and 8, which we may add together. Let us show the operation first, and then return to its explanation:

$$MnO_4' + 8H^{\cdot} \rightarrow 5(^{\cdot}) + Mn^{\cdot\cdot} + 4H_2O$$
$$NO_2' + H_2O + 2(^{\cdot}) \rightarrow NO_3' + 2H^{\cdot}$$

$$6H^{\cdot} \qquad\qquad 3H_2O$$
$$2MnO' + \textit{16}H^{\cdot} \rightarrow \textit{10}(^{\cdot}) + 2Mn^{\cdot\cdot} + \textit{8}H_2O$$
$$5NO_2' + \textit{5}H_2O + \textit{10}(^{\cdot}) \rightarrow 5NO_3' + \textit{10}H^{\cdot}$$

$$2MnO_4' + 5NO_2' + 6H^{\cdot} \rightarrow 2Mn^{\cdot\cdot} + 5NO_3' + 3H_2O$$

[Cancellation is here represented by *italic* type.]

In order to be able to cancel out the ionic charges in the respective equations, they must be of the same value numerically. Multiplying the first equation by 2, and the second by 5 (*i.e.* each equation is multiplied by the charge factor of the other), we obtain the common factor 10. Coincidently, this multiplication also gives us the molecular factors in the final equation. Next, we cancel for substances and ions common in the opposite sides of the respective equations. For instance, 5 molecules of water in the left side will offset, or cancel, 5 of the 8 molecules in the right side, leaving 3 molecules over. With regard to the hydrions, we have an excess of 6 on the left side. Finally, we add the numbers in the respective sides of the two equations. If we now examine the final ionic equation for surplus charges, we will find an excess of one negative charge on each side, showing that our equation is correctly balanced. Besides having seen in the partial equations what course each individual ion takes, we note in the result (*i.e.* the sum) that we need an acid ($H^{\cdot}$) to make the reaction go forward.

Experiment 1. To prove the necessity for this acid, I here [demonstrating] show a mixture of potassium permanganate and sodium nitrite. You note that no reaction is taking place. I will now add some hydrochloric acid and the solution will clear up completely, proving that the permanganate is reduced.

Substituting in the places of the ions in our ionic equation the three substances of this experiment, we have:

$$2KMnO_4 + 5NaNO_2 + 6HCl = 2MnCl_2 + 5NaNO_3 + 2KCl + 3H_2O$$

Judge, yourselves, of the correctness of this last chemical equation. It was absolutely constructed on the ionic equations with which we started out. With some little practice one soon becomes enabled to write almost any partial ionic equation offhand. With a sufficient number of such equations as a stock of ready prepared packets, as it were, one can arrange an indefinite number of combinations and gain an immense amount of information about a certain reaction, even prior to any performed experiment. Even a forward displacement of chemical equilibrium can quite often be foretold from the inspection of an ionic equation, since the formation of a less ionized ion, neutral water, a precipitate, or a gas, is plainly shown. Each of these formations affects the law of mass action in the sense that each may be considered as being removed from the system of the interacting substances. We shall see more of the practicability of the ionic equation in the sequel.

CAPACITY OF SUBSTANCES FOR OXIDATION AND REDUCTION.

Before coming to our subject proper, viz, the writing of the ionic equation for hydrogen dioxid, I want to say a few words about the capacity of a substance for oxidation and reduction. We know a few substances in chemistry, as silver (Ag°) which can be oxidized only one degree, if I may so state it (*i.e.* which can take up only one ionic charge); we have a case in argention ($Ag^{\cdot}$). Such substances are said to be univalent—or, simply, monads. Higher oxidation of argention, therefore, is impossible; it is, however, capable of reduction. Then, we have quite a num-

ber of substances which can be oxidized several degrees, and likewise can be reduced backward through the same number of degrees—as, for instance, iron (Fe°) which may be oxidized successively to diferrion ($Fe^{\cdot\cdot}$) and triferrion ($Fe^{\cdot\cdot\cdot}$). Now, knowing all the possible valencies (capacity for ionic charges) of the various substances, we can judge their capacity for either oxidation or reduction. Let us take, for example, diferrion ($Fe^{\cdot\cdot}$). This ion can be oxidized to triferrion ($Fe^{\cdot\cdot\cdot}$) or reduced to free iron (Fe°). It has therefore a capacity for either oxidation or reduction—that is, diferrion may be employed either as an oxidizing agent or as a reducing agent. Ordinarily, this capacity can be adjudged from the inspection of the ionic charge, or, in case of a complex ion, it can be readily calculated by a simple rule which I discussed in my paper on Arsenic Pentoxid —as, for instance, the

Value of Mn in MnO_4: $Mn - 2 \times 4 = -1$; $Mn = -1 + 8 = +7$

From the relative change of the ionic charges in the respective sides of the equation, we have a means of detecting where oxidation and where reduction is taking place. The capacity of hydrogen dioxid stands in the same position as diferrion, because it can act either as an oxidizing or as a reducing agent, but the transfer of ionic charges is not so readily apparent, and its recognition requires some postulation, since the valency of hydrogen is always positive 1, and that of oxygen always negative 2. Neither hydrogen alone nor oxygen alone can occupy a mid-position like diferrion. Hence the capacity of hydrogen dioxid for oxidation and reduction must consist in the relative dissociation of the combination of its two elements.

OXIDATION OF HYDROGEN DIOXID.

Proceeding on the supposition that all the oxygen of hydrogen dioxid goes to free oxygen, then the two atoms of hydrogen must remain as hydrions, since no escape of elementary hydrogen can be made out. These two hydrions appearing on the right side of the ionic equation must be offset by two positive charges on the opposite side, so as to give an equal surplus of charges on each side of the equation. Accordingly, then:

$$H_2O_2 + 2(\cdot) \rightarrow 2H\cdot + 2O \qquad (9)$$

If this ionic equation be correct, it will represent a true counterpart to the ionic equation for the reduction of a permanganate ion, *i.e.* it will add with the latter to give a valid and complete ionic equation for the reduction of the permanganate and oxidation of the dioxid. Let us write these two equations one over the other, for the purpose of adding them:

$$MnO_4' + 8H\cdot \rightarrow 5(\cdot) + Mn^{\cdot\cdot} + 4H_2O$$
$$H_2O_2 + 2(\cdot) \rightarrow 2H\cdot + 2O$$

The ionic charges in the two equations must be of the same value in order to cancel out. Hence, multiplying the first equation by 2 and the second by 5, we obtain:

$$\begin{array}{l} \qquad 6H\cdot \\ 2MnO_4' + \mathit{16H}\cdot \rightarrow \mathit{10}(\cdot) + 2Mn^{\cdot\cdot} + 8H_2O \\ 5H_2O_2 + \mathit{10}(\cdot) \rightarrow \mathit{10H}\cdot + 10O \\ \hline 2MnO_4' + 5H_2O_2 + 6H\cdot \rightarrow 2Mn^{\cdot\cdot} + 8H_2O + 10O \end{array} \qquad (10)$$

Experiment 2. Taking this equation as a guide, let us perform the following

experiment: We take a mixture of potassium permanganate and sulfuric acid, adding, lastly, hydrogen dioxid. The permanganate is instantly reduced. If while the reaction is going on we apply a glowing match, the latter will be re-ignited, proving the escape of elementary oxygen. It may be well to point out that the order in which we added the substances should be noted; in other order the permanganate, coming first in contact with H_2O_2, might be reduced to manganese dioxid.

If we now substitute for the ions in our ionic equation the chemical substances which we used in this experiment, namely, potassium permanganate and sulfuric acid, we obtain the following reaction:

$$2KMnO_4 + 5H_2O_2 + 3H_2SO_4 = 2MnSO_4 + K_2SO_4 + 8H_2O + 10O$$

—which is the same as the one we gave in our introduction. Since the reaction, which we accept as correct, was fundamentally derived from the partial equations, one for the permanganate ion and the other for hydrogen dioxid, we must admit their validity. But, the permanganate was reduced, *therefore the hydrogen dioxid was oxidized.*

Having now successfully established an ionic equation—see equation 9—for the oxidation of hydrogen dioxid, let us briefly discuss it. In the first place, hydrogen dioxid in being oxidized, *does not go to water,* because absolutely no water is shown. Secondly, the free oxygen (not ionic oxygen, O'' or —O—) which is shown in the equation comes *all* from the dioxid, and not in part from some other substance, as the permanganate. To prove this last assertion, I will show a chemical reduction of a substance which contains no oxygen at all.

Experiment 3. We will take a solution of potassium ferricyanid. This solution has some color. We render this solution alkaline by adding potassium hydroxid, for a purpose which will appear later. Now, adding hydrogen dioxid, instant reaction sets in, the color of the solution disappears, and free oxygen can be identified by applying a glowing match. The ferricyanid, $Fe(Cn)_6'''$ is reduced to ferrocyanid, $Fe(Cn)_6''''$. To show that this is so, we test the latter by adding cupric sulfate, which is a characteristic test, giving a brown precipitate of cupric ferrocyanid, $CuFe(Cn)_6$.

Experiment 4. We can also demonstrate the reduction of ferric chlorid ($FeCl_3$) by hydrogen dioxid. We add together ferric chlorid and hydrogen dioxid in a test tube and then apply heat. A free escape of elementary oxygen is shown by applying a glowing match, as above. In the same manner we can reduce permanganate (to MnO_2), copper, silver oxid, mercuric oxid, calcium chlorid and a few others in alkaline solution.

We might here add that, as a third consideration, the water which we see in the ionic reaction equation No. 10 does not come as such from the hydrogen dioxid. The hydrogen of the water, indeed, comes from the dioxid, but the oxygen is from some other substance—from the permanganate in our case. The hydrogen of the dioxid goes to hydrions. Now, whether these hydrions take up oxygen from the oxygen compound to be reduced, to form water in this way, or whether they are neutralized to water by hydroxidions, depends on the composition and conditions of the reacting substances.

REDUCTION OF HYDROGEN DIOXID.

We have thus far demonstrated what becomes of hydrogen dioxid when it is *oxidized.* We are now desirous of knowing its history in case of its reduction. Let us first establish an ionic expression for this circumstance. We may conveniently proceed according to this reasoning: Reduction is loss of oxygen, or a gain of hydrogen. Either consideration, when applied to H_2O_2 would show

that H_2O, water, results. Suppose we add two hydrions. This gives us two molecules of water on the right side of the equation. (We might also have stated that to remove one oxygen atom from H_2O_2 we need two hydrions, which would lead to the same results, viz, two molecules of water.) Now, balancing for equal surplus of charges, we have

$$H_2O_2 + 2H\cdot \rightarrow 2(\cdot) + 2H_2O \qquad (11)$$

—or transposing the charges,

$$H_2O_2 + 2H\cdot + 2(') \rightarrow 2H_2O \qquad (11a)$$

We will prove the validity of this ionic equation by adding it with another partial equation for the oxidation, say, of an iodid. An iodid ion (I′) being oxidized, goes to free iodin (I°). Therefore, $I' \rightarrow (') + I°$. We may at once multiply this ionic expression in order to obtain the same charge factor, as in the H_2O_2 equation. We can now perform an addition:

$$\begin{array}{r} 2I' \rightarrow 2(') + 2I° \\ H_2O_2 + 2H\cdot + 2(') \rightarrow 2H_2O \\ \hline 2I' + H_2O_2 + 2H\cdot \rightarrow 2I° + 2H_2O \end{array}$$

The sum, therefore, of these two partial expressions is a complete ionic equation for the oxidation of any iodid and the reduction of hydrogen dioxid. It shows us, besides the resulting substances, that an acid is necessary with the reacting substances.

Experiment 5. For the respective ions on the left side of the equation, let us take potassium iodid and hydrochloric acid. Upon adding the peroxid, the iodid becomes instantly oxidized to free iodin. We prove this by adding starch emulsion, which turns the solution blue, starch being a test for free iodin.

(In connection with this experiment, I would show the same reaction as given in W. Simon's "Manual of Chemistry," 9th ed., page 152:

$$2KI + H_2O_2 = 2KOH + 2I$$

In explanation, Professor Simon adds the following: "The action is more intense if the water is first acidified with 5 or 10 drops of a dilute acid." Now, as a matter of fact, no KOH is produced in this reaction. We show this by adding some phenol-phthalein, which, in presence of hydroxidion, exhibits a characteristic red. The potassium hydroxid, though present in stoichiometrical quantity, as shown in the equation, does not affect the phenol-phthalein. To show what effect KOH has on phenol-phthalein, let us add a drop or two of the former. Note the change. Professor Simon's statement about the acid is positively and necessarily shown in our reaction equation.)

Thus, as in experiment 5, quite a number of substances can reduce hydrogen dioxid, as lead ion, arsenic, tin, bismuth, iron, chromium, potassium, ferrocyanid, sulfur, chlorin, and bromin—all in acid solution.

The reaction of our experiment is represented as follows:

$$2KI + H_2O_2 + 2HCl = 2I + 2H_2O + 2KCl$$

—which, as we see, was correctly deduced from our ionic equations. Hence our preceding speculation was valid, and our ionic equation teaches us that hydrogen peroxid, in being reduced, *goes to water alone*—no oxygen, whether atomic or molecular, being given off.

For the purpose of comparison, and with a view of establishing additional facts about hydrogen dioxid, we again present equations 9 and 11a:

$$H_2O_2 + 2(\cdot) \rightarrow 2H\cdot + 2O \quad \text{(Oxidation equation of } H_2O_2.\text{)}$$
$$H_2O_2 + 2H\cdot + 2(') \rightarrow 2H_2O \quad \text{(Reduction equation of } H_2O_2.\text{)}$$

To the philosopher, the addition of these two equations might be of argumentative value:

$$H_2O_2 + 2(\cdot) \rightarrow 2H\cdot + 2O$$
$$H_2O_2 + 2H\cdot \rightarrow 2(') + 2H_2O$$
$$2H_2O_2 \rightarrow 2H_2O + 2O$$

The addition thus carried out, means that the same substance oxidized and reduced itself. But hydrogen dioxid added to hydrogen dioxid remains hydrogen dioxid. Therefore, the result: $2H_2O_2 \rightarrow 2H_2O + 2O$, is impossible. Accordingly, even *per se* hydrogen dioxid cannot go to water and oxygen. It seems we are here making ourselves liable to sophistry. No!—the very result of this addition proves that our ionic equations were correctly established, if we subjoin the following postulation of the mechanism according to which hydrogen dioxid probably dissociates:

$$\overbrace{H_2O + O''}^{(1)} + \overbrace{2H\cdot + 2O}^{(2)} = 2H_2O + 2O$$
$$\underbrace{\qquad\qquad}_{H_2O}$$

This scheme shows the individual progress of each molecule of hydrogen dioxid—(1) its reduction, (2) its oxidation. Note the ionic hydrogen of molecule (2) and ionic oxygen of molecule (1) joining to form neutral water. Generally, hydrogen is a reducer and oxygen an oxidizer, hence by our scheme also molecule 2 is the reducer and molecule 1 is the oxidizer. This scheme, furthermore, shows that the individual molecule cannot dissociate in oxygen and water. Hence, also, hydrogen dioxid cannot participate in a reaction of the double decomposition.

Contrary to this last statement, we find in Alex Smith's "Chemistry," on page 305, the following:

> Hydrogen peroxid, in solution in water, is a feeble acid. The normal molar weight and very small electrical conductivity show that only a very small proportion of it can be ionized. As an acid, it enters into double decomposition readily. Thus, when it is added to solutions of barium and strontium hydroxids, the hydrated peroxids appear as crystalline precipitates:

$$Sr(OH)_2 + H_2O_2 \rightleftarrows 2H_2O + SrO_2''$$

I wish to point out that this reaction is no double decomposition at all; it is a reaction of oxidation and reduction. Note that the valency of strontium in the hydroxid is two, in the peroxid it is four. Even if we accept Professor Smith's view that strontium is bivalent, supposing it to be formulated on the "peroxid structure," $Sr\langle^{O}_{O}$ it will be quite difficult to make out a case of double decomposition, since hydrogen dioxid cannot ionize directly into hydrogen and oxygen, as shown in the following scheme:

$$\overline{Sr[\underbrace{(OH)_2 + H_2}]O_2} \rightarrow 2H_2O + SrO_2$$

—in which a reaction between individual molecules is represented.

The above consideration is rather speculative, but let us review the above two equations as scientists. With regard to the charges, we dispose of the subject by saying that these simply stand for valencies (ionic charges) which are not set free, but become available when substances are present which can give up positive or take up negative charges. In both equations we notice non-dissociated product substances, oxygen in the one and water in the other. These, we know, are the cause of the forward displacement of equilibrium. In the first equation we note hydrions ($2H\cdot$) on the right side; in the second we observe the same number on the left side. In other words, hydrogen dioxid, *in being oxidized* (or as a reducing agent) produces an acid, and *in being reduced* (or, as an oxidizing agent) requires an acid. The necessity of an acid in the reduction of hydrogen dioxid was directly demonstrated in our experiment 5. We also stated in connection with that experiment that a number of substances can reduce H_2O_2 in acid solution. But, with regard to the production of an acid or hydrion ($H\cdot$) in the oxidation of H_2O_2, we have to enter upon a somewhat extended discussion.

The hydrion appearing on the right side of our equation has a tendency to reverse the chemical reaction, so that.

if we desire forward displacement, the hydrion must be removed as fast as it is formed. This we do by adding hydroxidion (OH') on the left side. Hence, *alkalinity* of condition becomes essential for the oxidation of hydrogen dioxid. That this statement is in accordance with facts was shown in experiment 3, where we added potassium hydroxid for the reduction of potassium ferricyanid. In experiment 4 we did not add an hydroxid, yet hydroxidion was used up in the reduction of ferric chlorid ($FeCl_3$) or the oxidation of the dioxid. We know that ferric chlorid reacts acid, owing to hydrolysis, and whenever hydrions occur in this manner there must necessarily also be a corresponding amount of hydroxidions. In the present case, the hydroxidion forms ferric hydroxid, which is responsible for the peculiar color of the ferric chlorid solution. Thus we see how hydroxidion was used up in the process.

In further elucidation of this subject, let us take an example from experience. Manganous ion ($Mn^{\cdot\cdot}$) has a tendency to become oxidized by the oxygen of the atmosphere, as is exemplified in the succeeding expression:

$$2M^{\cdot\cdot} + O + 5H_2O \rightleftarrows 2Mn(OH)_3 + 4H^{\cdot}$$

The hydrions which are produced at once start to react backward, so that chemical equilibrium must result, sooner or later, depending on the relative concentration of the ions on each side. The reaction is reversible, as we show by the double arrows. Now, if we want forward displacement (*i.e.* oxidation of the manganous ion), we neutralize the hydrion by adding hydroxidion, which, together with the latter, becomes non-dissociated water ($H^{\cdot}OH' = H_2O$). If we wish to retard this forward reaction, we add an acid ($H^{\cdot}$) which represses the progress toward the manganous condition, or, in other words, checks oxidation. This is why an addition of acid to any manganous salt solution is necessary for preservation. This is also the reason why nearly all samples of hydrogen dioxid react acid. Now, since alkalinity favors oxidation and acidity benefits reduction, and since oxidation and reduction must be referred to one and the same chemical reaction—because in proportion as one substance is oxidized, another substance must necessarily be reduced—one will readily admit the impossibility of effecting favorable conditions in both directions simultaneously. We cannot add hydrion and hydroxidion at the same time, because each neutralizes the other. Hence, a compromise must be reached somewhere, which chemical equilibrium will correctly adjust.

To illustrate, we subjoin the following consideration: Suppose we wished to reduce a permanganate by hydrogen dioxid. To favor the reduction side we should add an hydroxid, and at the same time to benefit the oxidation side (the H_2O_2)—which takes place in the same reaction—we should add an acid. Adding both base and acid would be absurd. If, now, we add acid alone, the permanganate will be reduced to manganous ion, $Mn^{\cdot\cdot}$ (see equation 10), and if we introduce an hydroxid alone, the permanganate will be reduced to manganese dioxid, MnO_2 (see *infra*, equation 14). With the acid, $5H_2O_2$ are oxidized, while with the base we succeeded in oxidizing only $3H_2O_2$ with the same amount of the permanganate, viz, $2MnO_4'$. If we now examine the degree of reduction in the permanganate, we note it was also greater in the presence of the acid, because it was reduced to the manganous condition ($Mn^{\cdot\cdot}$), as against the tetravalent condition (MnO_2) in the alkaline solution. This was necessary, because one substance is reduced in proportion as the other is oxidized. But, why did not the alkaline condition produce equal or even greater effect on the reduction of the permanganate? To this we reply: Because the permanganate is a *typical* oxidizing agent, or because the hydroxid repressed the oxidation of H_2O_2 to just this extent. Let us hear what Professor Ostwald says on this point ("Principles of Inorganic Chemistry"):

In oxidation and reduction processes, therefore, a change in the neutrality, or,

more generally, in the acid or basic condition, generally occurs. If hydrion is used up in the reaction, this will, in accordance with the law of mass action, take place all the more readily the more hydrion is present, or the more acid the solution is. The same holds good when hydrion is not used up, but hydroxidion is formed. For, since the latter unites with hydrion to form neutral water, the two processes are equivalent in the presence of water. If, on the contrary, hydrion is formed in the process, the latter will take place better in the presence of hydroxidions, and will be retarded or rendered practically impossible by the presence of hydrion. In both cases, indeed, chemical equilibria are established. Very frequently, however, these equilibria are so much toward the one side of the reaction equation that it is not possible to detect the presence of the substances on the other side.

The last sentence of this quotation contains a great truth for us, and in order to exhibit a few reaction equations in substantiation we want to first develop the partial ionic equations *in alkaline condition,* from which to deduce those reaction equations which we wish to show. The method of procedure is quite simple: We first establish the ionic equations as we did before, and then neutralize the hydrions ($H^{\cdot}$) by adding hydroxidions (OH'). Let us take our oxidation equation, $H_2O_2 + 2(\cdot) \rightarrow 2H^{\cdot} + 2O$. Here there are two hydrions on the right side. Now, adding two hydroxidions on the left side, the two hydrions become two molecules of neutral water. Embodying this fact in our equation, we now obtain

$$H_2O_2 + 2(\cdot) + 2(OH)' \rightarrow 2H_2O + 2O \qquad (12)$$

It should be remembered that the H_2O does not come from H_2O_2; it is obtained by neutralization from the hydrions. Next, we will derive an expression for the reduction of a permanganate, for example: A permanganate in presence of a base is reduced to manganese dioxid (MnO_2). We write down the permanganate, MnO_4'. Opposite this, on the right side of the equation, we write the symbols for manganese dioxid, $\underline{MnO_2}$, which we underline to show that it is a precipitate and therefore not ionized. Two oxygen atoms of the permanganate remain over. To take these up, we add four hydrions ($4H^{\cdot}$) on the left side, which will give us two molecules of water on the left side of the equation. Remembering, now, that the valency of Mn in the permanganate is seven, and in the dioxid four, and balancing the equation for equal surplus of electric charges, we have:

$$MnO_4' + 4H^{\cdot} \rightarrow MnO_2 + 2H_2O + 3(\cdot)$$

This expression must be in the alkaline condition. Proceeding as we did with hydrogen dioxid, we write $4(OH)'$ on the opposite side of the hydrions, which becomes neutralized to $4H_2O$:

$$MnO_4 + 4H_2O \rightarrow \underline{MnO_2} + 2H_2O + 3(\cdot) + 4(OH)'$$

Showing water on one side of the equation only, we have:

$$MnO_4' + 2H_2O \rightarrow \underline{MnO_2} + 3(\cdot) + 4(OH)' \qquad (13)$$

We now have two ionic equations *in alkaline condition,* which we may add to obtain a complete ionic reaction equation as above referred to:

$$\begin{array}{l} MnO_4' + 2H_2O \rightarrow MnO_2 + 3(\cdot) + 4(OH)' \\ H_2O_2 + 2(\cdot) + 2(OH)' \rightarrow 2H_2O + 2O \\ \hline \\ 2MnO_4' + 4H_2O \rightarrow 2MnO_2 + 6(\cdot) + 8(OH)' \\ 3H_2O_2 + 6(\cdot) + 6(OH)' \rightarrow 6H_2O + 6O \\ \hline \\ 2MnO_4' + 3H_2O_2 \rightarrow \underline{2MnO_2} + 2(OH)' + 2H_2O + 6O \end{array} \qquad (14)$$

If we substitute $KMnO_4$ for the ion MnO_4', we obtain the following chemical reaction:

$$2KMnO_4' + 3H_2O_2 \rightarrow \underline{2MnO_2} + 2KOH + 2H_2O + 6O$$

Experiment 6. We will carry out this experiment strictly, according to the information obtained from the reaction equation. We take potassium permanganate and hydrogen dioxid. We note the precipitate MnO_2. We test for free oxygen by a glowing splinter; we test for the $2(OH)'$ by phenol-phthalein, which gives a peculiar red to the solution.

While no hydroxid is indicated on the left side of the equation, the reaction is facilitated in alkaline solution.

Experiment 7. We take Fehling's solution, which, disregarding the tartrate, is an alkaline solution of cupric sulfate. Upon adding hydrogen dioxid, a violent effervescence occurs, and the escaping oxygen is detected by a glowing match. Upon heating, we will finally observe the appearance of a salmon color, which is characteristic of cuprous oxid.

The following is a brief indication of the ionic expressions:

$$\begin{array}{rl}
2Cu^{\cdot\cdot} + H_2O \rightarrow \underline{Cu_2O} + 2(\cdot) + 2H^{\cdot} & \text{(Written offhand.)} \\
\hline
2Cu^{\cdot\cdot} + H_2O + 2(OH)' \rightarrow \underline{Cu_2O} + 2(\cdot) + 2H_2O & \text{(Rendered alkaline.)} \\
\underline{H_2O} & \\
H_2O_2 + 2(\cdot) + 2(OH)' \rightarrow 2H_2O + 2O & \text{(H_2O_2 expression added.)} \\
\hline
2Cu^{\cdot\cdot} + H_2O_2 + 4(OH)' \rightarrow \underline{Cu_2O} + 3H_2O + 2O & \text{(15)}
\end{array}$$

Substituting $CuSO_4$ for the ion $Cu^{\cdot\cdot}$ and KOH for $(OH)'$ ion, we obtain the chemical reaction:

$$2CuSO_4 + H_2O_2 + 4KOH = Cu_2O + 2K_2SO_4 + 3H_2O + 2O$$

In this reaction equation, the hydroxid-ion is shown on the left side of the equation.

Experiment 8. Precipitating from silver nitrate by potassium hydroxid, we first obtain silver hydroxid, which passes instantly to silver oxid. We will use this same highly alkaline solution and add hydrogen dioxid. We note the escape of free oxygen, which we identify by a glowing match. The black substance which we observe is reduced silver.

The reaction of silver oxid with hydrogen dioxid is, briefly:

$$\begin{array}{rl}
Ag_2O + 2H^{\cdot} \rightarrow \underline{2Ag} + 2(\cdot) + H_2O & \text{(Written offhand.)} \\
Ag_2O + 2H_2O \rightarrow \underline{2Ag} + 2(\cdot) + H_2O + 2(OH)' & \text{(Rendered alkaline.)} \\
\hline
Ag_2O + H_2O \rightarrow \underline{2Ag} + 2(\cdot) + 2(OH)' & \text{(Water shown on one side.)} \\
\underline{H_2O} & \\
H_2O_2 + 2(\cdot) + 2(OH)' \rightarrow 2H_2O + 2O & \text{(H_2O_2 expression added.)} \\
\hline
Ag_2O + H_2O_2 \rightarrow \underline{2Ag} + H_2O + 2O & \text{(16)}
\end{array}$$

The reaction equations 14, 15, and 16, as well as equation 10, bear out Professor Ostwald's statement.

I believe with all the demonstrations so far attempted, we may justly say that, on the whole, *reduction* of a substance requires an *alkaline condition,* while for oxidation an *acid condition* is essential.

INADEQUACY OF CURRENT VIEWS ON HYDROGEN DIOXID.

From what has been said, we may justly ask: Do all these chemical conditions of acidity, alkalinity, etc., prevail in our therapeutic application of hydrogen dioxid? Is hydrogen dioxid oxidized, or is it reduced? If the body tissues, or in sepsis the bacterial cells, or in putrefactive processes the odorous gases are oxidized, then hydrogen dioxid is reduced with its resulting molecular water. In this case, no free oxygen is given off, and besides, the conditions must be acid. If we allow that the tissues, etc., are reduced, then hydrogen dioxid becomes oxidized, giving off elementary oxygen—which is by no means "nascent," as is so often erroneously supposed. In the latter event the conditions should be alkaline. Nearly all works on therapeutics lead us to infer that hydrogen dioxid decomposes into water and oxygen. Some embody this statement in the text, others convey this impression by the context of their treatises. It is true, hydrogen dioxid, in a sense, does go to water and oxygen, but not simultaneously in one and the same reaction, as oxygen alone is given off in one process, and water alone in another. One authority says that hydrogen dioxid "is split up into oxygen and water . . . . it oxidizes the bacteria and odorous gases . . . . but it should not be injected into the pus cavities unless free drainage is established, as otherwise the free liberation of oxygen will force the infection into deeper structures." (Prinz.) Another authority says, "Its action [*i.e.* that of H_2O_2] is solely that of an oxidizing agent, and any irritation from it corresponds to the energy of oxygen liberation." (Long.) A third authority states that "When hydrogen dioxid is applied to the mucous membranes, it decomposes into water and oxygen, the latter being given off in large quantities. The oxygen thus liberated is in the nascent state and readily oxidizes surrounding substances." (Buckley.) All these authorities, while representing hydrogen dioxid as an oxidizing agent, speak of the liberation of free oxygen at the same time. Now these two facts cannot go together, for when hydrogen dioxid oxidizes something else it is itself reduced, in which case water alone is given off. And when we have liberation of free oxygen, hydrogen dioxid is oxidized, and the tissues, bacteria, etc., must be reduced. The entire confusion arises from the fact that H_2O_2 has never been properly considered under the distinct and separate processes of oxidation and reduction. As the purpose of this paper was to bring out the chemistry of hydrogen dioxid, rather than its therapeutics, I shall be amply repaid if my efforts in that direction ever contribute to the future pharmacology of this important agent, hydrogen dioxid.

[If we accept the Electrolytic Dissociation Theory as being correct, the foregoing arguments of Dr. Fette and his conclusions are very valuable. He seems to have overlooked the fact, however, that hydrogen dioxid, in a neutral solution, will react with itself, this reaction being $2H_2O_2 = 2H_2O + O_2$. Oxygen will be evolved, and the solution loses strength. It is necessary to add some acid to H_2O_2 solutions to prevent this action. By so doing, the oxidizing action of H_2O_2 is suppressed, and the solutions will keep.—Ed.]

THE INTERDEPENDENCE OF PYORRHEA ALVEOLARIS AND SYPHILIS.

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IS pyorrhea alveolaris a local manifestation of infection by the *Treponema pallidum?*

For many years mercury has been the universal specific for syphilis, and its value in this respect is unquestioned. It is also true that its worth in the treatment of other diseases is not so well substantiated or widely accepted.

THE EFFICACY OF MERCURY.

Recently, one of the mercurial salts has been found to be marvelously efficacious in effecting a cure for pyorrhea alveolaris. Cases which have defied correction for years have responded promptly to a deep gluteal injection of succinimid of mercury, and astonishing results have been obtained within the short space of a week, amounting to what appears to be a cure within a month.

Why is mercury so efficient in correcting these conditions, which have defied all other forms of medication?

PYORRHEA IN SYPHILITICS.

For many years, syphilographers have recognized two distinct types of pyorrhea alveolaris in syphilitic cases, the first type being true pyorrhea and being allayed, if not cured, under mercurial treatment, the other type being but a syphilitic mercurialism, clearing up after suspension of the drug.

Treponema pallidum is not a pus-producing organism. It belongs to the same class of infectious granulomata as the causative organisms of leprosy and tuberculosis. Treponema exerts a pyogenic action in the tissue where it is found, and also refuses to thrive on healthy tissue, but develops rapidly in tissues such as are found in a disturbed metabolic state.

The mouth of every individual is the host of a vast number of living organisms maintained in a condition innocuous to the general health by the resistance encountered. As long as the system is in a healthy condition, attenuated treponemæ might be present and do no damage. As soon as the economy becomes weakened, the presence of the treponema can exert a pyogenic influence which enables the pus-producing organisms to express their individuality in a manifestation of pyorrhea, which without the primary influence of the treponema would have been impossible.

HUTCHINSON'S TEETH.

Every dentist is familiar with Hutchinson's teeth, and is aware of their positive diagnostic importance. These teeth are found in the mouths of perfectly healthy individuals, and it is impossible to obtain, even after the most painstaking and careful inquiries, any history of syphilitic infection in previous generations. These teeth are observed in one member of a large family, and are absent in all others of the same family. Bearing this in mind, should hereditary syphilis be the cause of pyorrhea, it does not follow that all infected with treponema should exhibit characteristic pyorrheal symptoms.

NOGUCHI'S FINDINGS.

No less an authority than the famous bacteriologist, Dr. Hideyo Noguchi, of the Rockefeller Institute of Medical Re-

search, has recently published the record of his discovery of two new organisms in pyorrheal research, which he has been able to isolate by improved cultural methods. To these organisms Dr. Noguchi has given the names *Treponema mucosum* and *Treponema microdenticum*. Both these organisms are spirochetæ. The treponema mucosum in form is about half as large as the spirillum Vincenti, its curves being much more regular, and similar to the organism of syphilis. It will not grow on healthy tissue, and, like the treponema pallidum, requires tissue in a disturbed metabolic state. It also exerts a pyogenic action on the tissue in which the growth occurs.

It seems not unreasonable to presume, in view of existing facts, that these organisms isolated by Dr. Noguchi might be modified forms of the syphilitic organism and the chief causative organism of pyorrhea, assuming that the chief etiological factor is of metabolic origin, and the infection is due to pus-producing cocci, but secondary. In any case, the matter is worth general attention.

SUCCINIMID OF MERCURY IN THE TREATMENT OF PYORRHEA.

In an article published in *Items of Interest*, April 1915, the writer recorded a few of the results of his treatment of pyorrhea with succinimid of mercury, this treatment being based on the results of Dr. Barton L. Wright's experiments in treating tuberculosis and other vegetable-parasitic diseases with this metal. The statement was made there that, aside from a probable direct action on the causative organisms, the well-known tonic effects of the drug merit attention.

In following up this treatment, knowing that mercury is a specific for syphilis and also appears to be a specific for pyorrhea, the question of the etiology, in view of the arguments above cited, led to but one reasonable conclusion, viz, that the causative organisms are similar.

CLINICAL FINDINGS AS TO ASSOCIATION OF PYORRHEA AND SYPHILIS.

There being no literature available connecting the two diseases, considerable hesitation was felt in attempting to classify pyorrhea as the sequela of that blighting scourge of humanity, syphilis, and yet the preponderance of evidence obtainable seemed to be in favor of this theory.

In this connection, and as evidence in support of this idea, it is important to note the experience of Dr. Larned and Dr. Baldwin, who, in an examination of the teeth of a large number of syphilitic patients, found many cases of pyorrhea. Following their precedent, a large number of pyorrhea cases were examined, and two-thirds of these gave a history of syphilis. This alone is a dependable basis for the assumption that the diseases were in some way connected. Being impressed with the importance of this idea, and notwithstanding the fact that the amœbic theory seemed to be gaining general acceptance, a series of tests were instigated to determine as far as possible the value of this supposition.

These tests could be but unsatisfactory for the most part, because of the fact that the Wassermann test is of value in only about 80 per cent. of cases, and there is always a possibility of the cases examined being of the unreliable ten per cent. Moreover, there was a possibility of a syphilitic patient being also afflicted with pyorrhea of different origin. A serious handicap also existed because of the fact that the Wassermann test is absolutely valueless in hereditary syphilis, where the organisms are not present in sufficient numbers to give a positive reaction. Nevertheless, this theory seemed worthy of some investigation to demonstrate its value or its uselessness, and accordingly a large number of these tests were made.

P. A. Surgeon Matthew H. Ames, U.S.N., and the writer secured the necessary permission to enter the Massachusetts State Prison at Charlestown and obtained samples of the blood of those of the inmates of this institution whose mouths exhibited well-advanced pyorrhea. In this connection, kind assistance was rendered by Dr. McGlauflin, the prison physician, and Dr. Latham, the prison dentist.

Patients were selected whose medical record gave no history of their having undergone treatment for syphilis. They came from all walks of life and were chosen solely because of the fact that their mouths presented typical cases of pyorrhea, and blood was taken only from these cases.

The results of these tests prove but little to the exacting mind. The analyses were made in the United States Naval Hospital in Chelsea, Massachusetts, by experienced laboratory workers of the navy, and while positive reactions were obtained, they were not of sufficient number to warrant the assumption that pyorrhea is caused by attenuated treponema pallidum. Neither can this assumption be successfully disputed, as it is based on the results of these experiments. The tests were predestined to failure, as has been pointed out at the beginning of this article, but a field of investigation is opened which should furnish much light on a subject on which few investigators have cared to express their opinions.

In connection with the idea advanced in this article, it is but fair to state that Drs. Wright and White, in their use of succinimid of mercury, have had but two syphilitic cases in fifty-four which have been cured of pyorrhea by the use of mercury. The fact of their not being syphilitic was based on a negative Wassermann blood test.

This article does not attempt to decry the possibility that mercury may be efficacious in curing pyorrhea by reason of its affinity for, or action on, other organisms than that of modified treponema, nor to preclude the possibility that endamœba plays its part; it aims purely to present another theory for which there seems to be a reasonable basis.

The test of the spinal fluid, the Noguchi test, the gold test, and others available to investigators along the lines indicated, together with further clinical observations, will prove of more positive diagnostic importance in this direction.

THE CHEMICAL CONSTITUTION AND THE PHYSICO-CHEMICAL PROPERTIES OF DENTAL AMALGAMS.

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(Report presented to Section IV of the Sixth International Dental Congress, London, 1914.)

UNTIL recently, chemical literature contained no data in regard to alloys of mercury with silver and tin. Our knowledge of this system was due to empirical experience in dental practice and to isolated measurements chiefly of changes in form and of crushing strength.

Since 1909 the study of these amalgams has been prosecuted in the chemical laboratory of Bristol University, and the following papers have been published on the subject:

(1) R. A. Joyner, *Trans. Chem. Soc.*, 1911, pp. 99, 195.

(2) Jas. W. McBain and R. A. Joyner, DENTAL COSMOS, June 1912, vol. liv, p. 641.

(3) W. A. Knight and R. A. Joyner, *Trans. Chem. Soc.*, 1913, 103, 2247.

(4) W. A. Knight, *ibid.*, 1914, 105, 639.

BINARY SYSTEMS: *Silver-Tin, Tin-Mercury, Silver-Mercury.*

Before passing to the consideration of the ternary system, silver-tin-mercury, which comprises the essential portion of dental amalgams, it seems advisable

briefly to review our knowledge of the binary systems above.

Silver-Tin. This system has been investigated by Petrenko,* and later by Joyner (*loc. cit.*), and the results of Joyner's work supplement and confirm Petrenko's conclusions.

There is only one compound between the elements silver and tin, viz, Ag_3Sn, containing 75 atoms per cent. of silver (approximately 73 per cent. silver by weight). All alloys containing a smaller proportion of silver, if they are well annealed, consist of Ag_3Sn and free tin. The compound Ag_3Sn exists in two polymorphic forms; one of these, alpha Ag_3Sn, is stable at all temperatures below 232°C., while the other, beta Ag_3Sn, is only stable above 232°C., and hence for our purpose may be ignored.

Tin-Mercury. Our knowledge of this system is due in the first place to W. J. Van Heteren,† and measurements of the solubility of tin in mercury, carried out by Joyner, agree well with Van Heteren's results. There is no compound formed between tin and mercury, but the solid separating out at any temperature consists of tin containing a small percentage of mercury in solid solution, while the liquid in equilibrium with that solid at the particular temperature considered is a saturated solution of tin in mercury. The solid tin thus contaminated with mercury is soft and friable, and does not harden even on keeping for years.

Silver-Mercury. According to Reinders‡ there are three compounds, viz. Ag_3Hg_4, Ag_3Hg_2, Ag_3Hg, between silver and mercury, but the first mentioned is the only one readily formed, and the last has not even been isolated with certainty. On the other hand, the compound Ag_3Hg_4 is familiar to dentists under the name of arbor Dianæ.

Ternary System: *Silver-Tin-Mercury.*

A. *Chemistry of Amalgamation.* The solid amalgams used for dental fillings are usually made by rubbing or shaking filings or turnings of the alloy with mercury and squeezing out some of the excess of mercury. Amalgams obtained in this way are pasty semi-crystalline solids, which harden within a few hours, although slight changes of form may take place for a considerable time. It is known that amalgams obtained from alloys of silver and tin may experience changes of volume extending over several weeks (see later).

The hardening of dental amalgams is obviously due to chemical change, and it has been shown conclusively, in accordance with the data outlines above, that the chemical reaction results in the breaking-up of the compound Ag_3Sn in order to form the compound Ag_3Hg_4, leaving all the tin in the free state. Here we may emphasize the danger of using too much mercury for the amalgamation, as excess of mercury, beyond that required to convert the silver into the compound Ag_3Hg_4, acts so as permanently to soften the free tin in the amalgam, owing to the formation of solid solutions of mercury in tin which never harden.

The investigation of this chemical change was carried out by determining the effect produced on the liquid amalgam by taking excess of mercury and varying amounts of tin and silver. At temperatures of 25°C. and 63°C. it was established that the composition of the liquid amalgam was quite independent of the ratio between the amounts of tin and silver. It had the same tin-content as was obtained from pure tin, and further, the amount of silver present in it was independent of the amount of tin. This shows that in the presence of mercury the tin and the silver in the alloy undergoing amalgamation cannot be combined with one another in any way, and therefore the products of amalgamation are the same as if each metal had been amalgamated separately. Hence, the solid products of amalgamation with excess of mercury are solid solution of mercury in tin, and arbor Dianæ, Ag_3Hg_4.

* *Zeitsch. anorg. Chem.*, 1907, 53, 200.

† *Ibid.*, 1904, 42, 129.

‡ *Zeitsch. physikal. Chem.*, 1906, 54, 609.

The equation of amalgamation is therefore

$$Ag_3Sn + 4Hg = Ag_3Hg_4 + Sn,$$

and the alloy, which is a mechanical mixture of the compound Ag_3Sn and tin, becomes a mixture of arbor Dianæ and tin.

Further, it was found that the liquid amalgams resulting from unaged filings have the same composition as those resulting from aged filings, provided that sufficient time is allowed for the attainment of equilibrium. Thus the aging of the filings solely retards the initial stages of amalgamation.

B. *"Aging" of Filings of Alloys of Silver and Tin.* Dentists have long held that alloys of silver and tin, which constitute the essential portion of dental alloys, undergo profound changes in their properties merely through lapse of time. This phenomenon is technically called "aging," and in 1895–97 Dr. G. V. Black published a classical series of researches bearing on the problem. He found that fresh filings of these alloys retained more mercury immediately after amalgamation than filings which had been aged. Aging could be brought about through the lapse of several months at ordinary temperature, or by heating to 100°C. for half an hour either in hydrogen or in air. Further, amalgams prepared from fresh filings showed quite different volume changes from those exhibited by aged filings.

Much work has been carried out in this laboratory to elucidate the nature of the aging of these alloys, the experimental method of investigation employed being essentially the same as that used by Black. A weighed quantity of filings is shaken with excess of mercury for a definite time. The excess of mercury is then squeezed out through chamois leather by the application of a constant pressure for a constant time. From the weight of the resulting amalgam the ratio of the weight of mercury retained to that of alloy taken is readily calculated. The following table exhibits the results of a few of the experiments performed here:

TABLE I.

Mercury Retained by "Aged" and "Unaged" Filings.

Composition of alloy.		"Unaged" filings.	"Aged" filings.	Ratio of mercury.
Atomic per cent. Ag.	Weight per cent. Ag_3Sn.	Mercury : alloy.	Mercury : alloy.	Unaged : aged.
100.0	0.0	1.26	1.18	1.0
85.0	60.6	1.99	1.63	1.2
75.0	100.0	2.10	0.71	2.96
70.0	92.8	1.65	0.84	2.0
55.0	72.0	0.89	0.36	2.6
40.0	51.7	0.88	0.38	2.4
35.4	45.4	0.89	0.49	1.8
25.0	31.7	0.86	0.52	1.7
10.0	12.6	0.77	0.49	1.6
3.84	4.8	0.57	0.60	1.0
0.0	0.0	0.43	0.45	1.0

It should be remarked that the amounts of silver and tin removed by the mercury squeezed out are quite negligible. Thus, at room temperature, the

solubility of silver in mercury is 0.076 atom per cent., or, expressed in another way, 1 gm. of mercury can dissolve approximately 0.0004 gm. of silver. Again, the solubility of tin in mercury at room temperature is very approximately 1 atom per cent., and therefore 1 gm. of mercury can dissolve 0.006 gm. of tin. It will be evident at once that there is no appreciable error introduced by neglecting the small amounts of silver and tin removed by the mercury squeezed out.

In Table I the composition of the alloy is expressed in atomic percentages of silver, and also in percentage by weight of the compound Ag_3Sn. The last column exhibits the ratio between the amounts of mercury retained by 1 gm. of unaged and aged filings. A glance at this last column shows that aging depends on the percentage of the compound Ag_3Sn present in the alloy, being greatest for pure Ag_3Sn and disappearing entirely for pure tin and for pure silver. This indeed is the conclusion arrived at after many further experiments, and we must therefore regard aging as being a property solely of the compound Ag_3Sn present in the alloy, due to polymorphism.

We have examined a number of similar intermetallic compounds such as Ag_3Sb, Cu_3Sb, Cu_3Sn in order to see if these also showed this property on amalgamation. The values given in Table II show that aging appears to be a unique property of the compound Ag_3Sn only.

TABLE II.

Alloy.	Freshly filed.	Heated at 100° for ½ hour.	Heated at 184° for 1½ hours.
	Mercury : alloy.	Mercury : alloy.	Mercury : alloy.
Ag_3Sn	2.10	0.71	. .
Ag_3Sb	1.0	1.0	0.98
Cu_3Sn	0.56	0.58	0.59
Cu_3Sb	0.49	0.57	. .

A number of other hypotheses have also been examined, one of those most closely investigated being the suggestion that aging may be due to superficial oxidation. This hypothesis is extremely simple and it is attractive, for it would account for the difference between the reactivity with mercury of unaged and aged filings. It seems *a priori* quite possible that filings of these alloys might become superficially oxidized when they are heated to 100° C. (even in hydrogen), since it is extremely difficult to exclude all traces of oxygen from the gas in which the filings are aged.

We have many facts which disagree with this hypothesis, however: Thus the aging of filings is not accompanied by any change in weight, although it is accompanied by a change in density. It takes place alike on heating the filings in hydrogen, in coal-gas, in air, or in a vacuum. Ozone, moist ozone, hydrogen dioxid and hydrogen sulfid do not age filings of the alloy Ag_3Sn at room temperature. Aging is not prevented by the presence of magnesium in the alloy, and hence is not due to oxygen contained in the alloy. Further, grinding in an agate mortar neither ages unaged alloy nor renders aged filings unaged. These facts, which here have been conclusively proved, clearly render untenable any hypothesis which assumes that the aging is due either to superficial or to internal oxidation.

Another hypothesis which has been closely examined is that aging may be due to the release by annealing of a state of strain produced in the alloy by the act of filing. Now, alloys of silver and tin containing less than 25 atoms per cent. of silver can be partially remelted at a temperature of about 220° C., *i.e.* below the transition point of alpha Ag_3Sn into beta Ag_3Sn. After cooling, bars obtained in this way do not differ in appearance or in hardness from ordinary bars. We have taken a quantity of *aged* filings of different alloys containing 10, 20 and 25 atoms per cent. of silver and have thus partially remelted them. On filing up the resulting bars the filings have given a

value for the ratio of mercury to alloy practically identical with the value for the *aged* filings from which these remelted bars were obtained. This disposes conclusively of the hypothesis last mentioned, for if the act of filing produced a state of strain in the original alloy, there can be no reason why it should fail to do so in the similar alloy obtained after partially remelting aged filings from the original bar.

It has also been shown that aging is not connected with the transformation of alpha Ag_3Sn into beta Ag_3Sn or *vice versa*. (For details of these experiments the reader is referred to the papers previously mentioned.)

It has been shown by repeated experiment that bars of alloy definitely do not age even after being heated to 115°C. for 15 days, whereas filings of the same alloy have been proved to be completely aged after 20 minutes at 100°C. We have found that the density of aged filings of the alloy Ag_3Sn is slightly greater than that of unaged filings from the same bar. By an independent method it has been shown that a contraction in volume, amounting to about 0.4 per cent., occurs on aging a quantity of filings of the alloy Ag_3Sn. This is at last something definite to go on; evidently aging is a polymorphic change taking place in the compound Ag_3Sn.* The puzzling problem remains as to why it does not take place until the alloy has been filed up. However, the conditions under which it occurs and its extent have now been pretty thoroughly elucidated. As has been already seen, the final result of amalgamation is not affected.

C. *Effect of Higher Temperatures.* The study of these amalgams at higher temperatures from the metallographic standpoint has so far occupied over a year and a half of continuous experiment. However, the results from the dental standpoint may be very briefly summarized. It was necessary to investigate the system at higher temperatures in order to be sure that the deductions at room temperatures were correctly drawn.

At room temperatures, as has been seen, the compound Ag_3Hg_4 is formed in nearly pure condition on amalgamation with sufficient mercury in the ordinary way, practically all the tin separating out from the crystals of Ag_3Hg_4 and remaining only mechanically mixed with them.

If amalgamation takes place at higher and higher temperatures the Ag_3Hg_4 resulting takes up more and more tin in the form of solid solution. This effect becomes noticeable between 70° and 90°C., and at such temperatures there is a marked expansion, which is very slowly reversed on cooling. It is surely evident that the practical dentist does best to avoid these very real and incalculable complications, with their slow after-effects of contraction, by taking the simple precaution of not heating his amalgam.

D. *Addition of Gold.* Dentists usually do not use alloys of silver and tin alone, but are accustomed to add at least one other metal in small amount to produce a "benevolent" effect, although there have been no data in existence to indicate in what form the other metal is present in the amalgam, nor indeed whether it is taken up by the other constituents at all. We have recently used a dilute unsaturated solution of gold in mercury for amalgamating the filings of silver-tin alloy, and have found that, under these circumstances, all the gold enters the solid amalgam, and practically none is left in the mercury squeezed out.

Four analyses of the gold solution used were carried out by wet methods, and gave the following values for the concentration of the gold in the solution:

(1) 0.077 per cent. by weight.
(2) 0.076 " " " "
(3) 0.077 " " " "
(4) 0.0767 " " " "

* Lowry and Parker, *Proc. Faraday Soc.*, December 1914, suggest that this polymorphic change is from the amorphous to the crystalline state.

After the amalgamation of the filings with this gold solution, both the solid amalgam and the squeezed-out solution were analyzed for gold. The results of the experiments performed thus far are as follows:

Silver Filings. (1) Weight of gold solution taken for amalgamation = 5.0712 gm.; weight of gold in squeezed-out mercury was quite negligible; weight of gold found in solid amalgam = 0.0032 gm., whereas weight of gold in the gold solution used for the amalgamation = 0.0039 gm. Hence, practically all the gold has gone into the solid amalgam.

(2) Weight of gold solution taken = 4.7779 gm.; weight of gold in squeezed-out mercury was quite negligible; weight of gold found in solid amalgam = 0.0036 gm., also showing that nearly all the gold has gone into the amalgam.

Tin Filings. No gold was obtained from 2.4962 gm. of squeezed-out mercury. The gold was found in the solid amalgam.

Filings of Ag_3Sn. No gold was obtained from 1.2929 gm. of squeezed-out mercury. From 8.8058 gm. of amalgam the weight of gold obtained = 0.0060 gm. Now, in this experiment 7.5978 of gold solution was used for the amalgamation, and this weight of solution contains 0.0059 gm. of gold. Hence in this case also all the gold has gone into the solid amalgam.

The significance of even these few experiments is at once grasped if it is recalled that here gold is being extracted by the solid amalgam from a mercury solution which is *unsaturated* with respect to gold. This is conclusive evidence that gold does either combine with or form solid solution with tin and mercury as well as with silver and mercury, and to this extent its presence in dental amalgam is justified from the chemical standpoint. Further experiments should lead to a precise knowledge of the combinations here involved.

E. *Volume Changes.* These should be discussed under two totally distinct headings. The first is the total differ-

TABLE III.

Total Volume Change on Amalgamating One Gram of "Unaged" Ag_3Sn at 20°C.

Hg taken.		Vol. of alloy.	Total initial vol.	Ag_3Hg_4 formed.		Ag_3Sn unacted on.		Sn formed.		Tin amalgam formed.		Total final vol.	Contraction.	
gm.	c.c.	c.c.	c.c.	gm.	c.c.	gm.	c.c.	gm.	c.c.	gm.	c.c.	c.c.	c.c.	%
1.2	0.0887	0.1020	0.1907	1.684	0.1243	0.338	0.0345	0.178	0.0244	. . .	. . .	0.1832	0.0075	3.94
1.4	0.1033	0.1020	0.2053	1.965	0.1451	0.227	0.0232	0.208	0.0286	. . .	. . .	0.1969	0.0084	4.10
1.6	0.1180	0.1020	0.2200	2.245	0.1657	0.117	0.0119	0.238	0.0327	. . .	. . .	0.2103	0.0097	4.41
1.812	0.1337	0.1020	0.2357	2.543	0.1877	. . .	. . .	0.269	0.0370	. . .	. . .	0.2247	0.0110	4.67
2.0	0.1476	0.1020	0.2496	2.543	0.1877	. . .	. . .	. . .	. . .	0.457	0.0516	0.2393	0.0103	4.13
2.2	0.1623	0.1020	0.2643	2.543	0.1877	. . .	. . .	. . .	. . .	0.657	0.0664	0.2541	0.0102	3.86

Data used: Density Hg at 20° C., 13.546. Sp. vol. Ag_3Hg_4, 0.0738. Sp. vol. unaged Ag_3Sn, 0.1020. Density of tin, 7.28. Sp. vol. tin amalgams, 0.113 and 0.101 respectively.

TABLE IV.

Total Volume Change on Amalgamating One Gram of "Aged" Ag_3Sn at 20°C.

Hg taken.		Vol. of alloy.	Total initial vol.	Ag_3Hg_4 formed.		Ag_3Sn unacted on.		Sn formed.		Tin amalgam formed.		Total final vol.	Contraction.	
gm.	c.c.	c.c.	c.c.	gm.	c.c.	gm.	c.c.	gm.	c.c.	gm.	c.c.	c.c.	c.c.	%
1.2	0.0887	0.1010	0.1897	1.684	0.1243	0.338	0.0341	0.178	0.0244	. . .	. . .	0.1828	0.0069	3.64
1.4	0.1033	0.1010	0.2043	1.965	0.1451	0.227	0.0229	0.208	0.0286	. . .	. . .	0.1966	0.0077	3.77
1.6	0.1180	0.1010	0.2190	2.245	0.1657	0.117	0.0118	0.238	0.0327	. . .	. . .	0.2102	0.0088	4.02
1.812	0.1337	0.1010	0.2347	2.543	0.1877	. . .	. . .	0.269	0.0370	. . .	. . .	0.2247	0.0100	4.26
2.0	0.1476	0.1010	0.2486	2.543	0.1877	. . .	. . .	. . .	. . .	0.457	0.0516	0.2393	0.0093	3.74
2.2	0.1623	0.1010	0.2633	2.543	0.1877	. . .	. . .	. . .	. . .	0.657	0.0664	0.2541	0.0092	3.50

The data used in the construction of Table IV are the same as those used in Table III, except that the specific volume of aged Ag_3Sn is 0.1010.

ence in volume between the initial constituents and the ultimate hardened amalgam; the second is the volume change, if any, taking place after the dentist has intimately mixed the alloy with mercury and is about to insert it in the tooth.

The former of these is a matter of comparative indifference to dentists, except that it indicates the extreme limits as well as the direction of possible volume changes. They may be calculated from the known densities of mercury, tin, and Ag_3Sn, which are the only initial constituents of silver-tin amalgam, and from the densities of arbor Dianæ, tin, and mercury dissolved in tin, which are the only final products. Tables III and IV exhibit the results of a series of such calculations for 1 gm. of Ag_3Sn taken in each case with different amounts of mercury. *A considerable, almost alarming, contraction results in every case.*

It is of interest to point out that these tables show the contraction for all cases in which mercury is not taken in excess of that required to form Ag_3Hg_4 (1.812 gm. Hg to 1 gm. Ag_3Sn). Considering, first, alloys of the composition Ag_3Sn, it is at once evident that under these conditions the contraction is directly proportional to the amount of mercury taken; if, for example, 0.906 gm. of mercury be taken, which is half the amount for Ag_3Hg_4, the contraction is just half that shown for 1.812 gm. of mercury, whether with aged or unaged alloy. Again, if 2 gm. of tin are also present, *i.e.* if 3 gm. of silver-tin alloy containing 24.3 wt. per cent. of silver be taken, the contractions for each case shown in these tables are unaltered (for 1 gm. of this alloy the contraction is one-third of those amounts). Similarly for 1 gm. of 50 atomic per cent. alloy the contractions are two-thirds of those shown in the table. Thus, as long as there is no excess of mercury, the contraction for 1 gm. of Ag_3Sn contained in the alloy is that shown in the table, the extra tin appearing only as unaltered ballast.

So much for the total possible volume

change under the first heading. It is evident that these would be the actual changes observed in the remotely conceivable case where the amalgamation took placé only after insertion into the tooth.

Every case occurring in dental practice must be intermediate between no volume change and the extreme changes indicated in the tables. This will depend upon how nearly the amalgamation is completed before insertion. We have observed almost all intermediate cases up to the two extremes of 0.2 per cent. and 2 per cent. Our investigation is as yet incomplete, as we have only carried out twenty-nine experiments up to the present, and subtle experimental difficulties have caused much delay.

The method employed in studying these volume changes under the second heading has been to amalgamate the alloys under various conditions and then insert them into a glass dilatometer filled with an organic liquid, the movement of the liquid meniscus in the capillary tube of the dilatometer being observed until it became stationary. The dilatometers were kept immersed in a thermostat at 25°C.

After the first few experiments deep mercury seals were employed around the ground-in stoppers of the dilatometers in order to prevent the possibility of leakage, but finally ground-in joints were given up and only sealed-in dilatometers were used. All the earlier results were then discarded. The chief difficulty has arisen from the high solvent power which some organic liquids exhibit for air.

In every single case a *contraction* has been observed, ranging from several per cent. with careless amalgamation to a fraction of 1 per cent. in the most favorable cases of thorough amalgamation.

Aged amalgams, with or without excess of mercury, contract much more than unaged amalgams. This is reasonable, for aging means retarded initial amalgamation, leaving more of the amalgamation to take place in the tooth, with the inevitable accompanying contraction. This is in spite of the fact that aged alloys are slightly denser than unaged alloys.

A few typical results are given in Table V. In every case but one, 2.64 gm. of alloy were mixed with mercury on a watch-glass and stirred for five minutes; thereupon the amalgam was worked on the hand for a further five minutes and placed in the dilatometer, which was filled with the liquid indicated. In the last experiment of this table the amalgamation was allowed to take place simply by shaking together the alloy and mercury in the dilatometer; this resulted in the greater contraction shown. The only times here

TABLE V.

Contraction of Silver-Tin Amalgams After Amalgamation.

Silver-tin alloy.		Mercury taken.		Liquid.	Time.	Contraction.
Unaged	20 at. % Ag	6.6 gm.	excess	glycerin	3 days	0.5%
"	20 " % Ag	6.6 gm.	"	paraffin oil	3 "	0.6%
"	20 " % Ag	2.0 gm.	no excess	glycerin	2 "	0.8%
"	60 " % Ag	6.6 gm.	excess	paraffin oil	2 "	1.6%
"	60 " % Ag	6.6 gm.	"	glycerin	6 "	0.9%
"	60 " % Ag	3.0 gm.	no excess	paraffin oil	2 "	0.3%
"	60 " % Ag	3.0 gm.	" "	glycerin	2 "	0.3%
Aged	60 " % Ag	1.5 gm.	" "	xylidin	6 "	2.2%
Unaged	60 " % Ag	3.0 gm.	" "	glycerin	3 "	1.1%

tabulated are the times elapsing till constant volume was attained.

It is conceivably possible that there may be an intermediate stage of amalgamation with either aged or unaged alloys, or in both cases; the greater contraction observed with aged filings might seem to indicate that this intermediate stage is different for aged and unaged alloys. If so, the equation given previously would represent only the initial and final stages of amalgamation. We propose to investigate this question more fully. We hope, however, that in the above we have laid a sound foundation for the study of dental alloys and their amalgams.

SUMMARY.

(1) Mercury forms no compound with tin; and the amalgam, which is a solid solution, remains permanently soft.

(2) Silver readily forms only one compound with mercury, namely, Ag_3Hg_4, arbor Dianæ.

(3) No compound of silver with tin exists other than Ag_3Sn.

(4) The aging of alloys of silver and tin is neither connected with superficial oxidation, nor is it a case of annealing after mechanical strain. It is a property solely of the compound Ag_3Sn contained in the alloys; it retards the initial stages of amalgamation, but does not affect the final products.

(5) When mercury is added to a silver-tin alloy the compound Ag_3Sn between silver and tin is broken up, the silver combining with the mercury to form arbor Dianæ, Ag_3Hg_4, the excess of tin remaining in the free condition as such. Any excess of Ag_3Sn remains untouched.

(6) At higher temperatures different relationships hold, for the Ag_3Hg_4 forms solid solutions with tin, and thus appreciable but slow expansion occurs, which is very slowly reversed after cooling.

From the above the following seems established beyond all reasonable question:

(1) Dental amalgam alloys containing less than 50 per cent. of silver are chemically just as resistant in the mouth as those containing more silver, since in every case a mixture of the same products (Ag_3Hg_4, Ag_3Sn, and Sn) results. However, an *unaged* silver-tin alloy must contain between 50 and 60 per cent. of silver in order that enough of the surplus mercury can be squeezed out (see Table I); such limits, of course, no longer hold if mercury and alloy are mixed by weight.

(2) The worst possible error in the mixing of a dental amalgam is to have mercury present in excess of the proportion required to form Ag_3Hg_4 with the silver present (*i.e.* a weight at most 2.4 times as great as the silver present), since this mercury will attack the free tin, with the formation of permanently soft tin amalgam. It is obviously just as important that such excess should not occur locally—*e.g.* at the surface of a filling, due to the manipulation while inserting in the tooth.*

The following points should therefore be emphasized in this connection: (*a*) Enough silver must be present to combine with all the mercury taken, to form Ag_3Hg_4. (*b*) If a silver-tin alloy too rich in tin be employed, the mechanical retention of this injurious excess of mercury (even after squeezing out as much as possible) becomes a certainty; this is readily demonstrated by weighing the alloy before and after amalgamation. (*c*) While, if all the mercury is locked up in the form of Ag_3Hg_4, it is chemically extraordinarily resistant and inert; on the other hand, when excess of mercury is present in the softened tin, it exists in very available form and must tend to produce salivation.

(3) Heating the pestle and mortar used for amalgamation, or heating a dental amalgam, should be avoided, as introducing slow after-changes of volume. These are at present incalculable, although they certainly exist.

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* See DENTAL COSMOS, vol. xlix, 1907, p. 1105.

(4) In every case, amalgams of silver-tin alloys contract for some days after amalgamation. This contraction is far greater when the amalgam has been imperfectly mixed. It is also greater for aged alloys, since here amalgamation is retarded. It is not so much the number of minutes which have elapsed since the amalgam has been mixed that diminishes the contraction in the tooth, as the time during which it has been actually and intimately worked by the dentist before insertion.

THE DENTAL MEDICINES OF PEDANIOS DIOSCORIDES.

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THE ancient writings on dental therapeutics contain so many conflicting statements relative to the sources of specific medications that it is extremely difficult to reach an unbiased decision regarding their origin. Plagiarism was of common occurrence among the early scribes; it was, however, not looked upon as a breach of literary etiquet in the same sense of the word as we interpret this term today. As an illustration we may be permitted to cite Pliny (79 A.D.), who in his famous "Naturalis historia" prides himself on the fact that he is able to present excerpts of nearly one hundred writers and their two thousand works. He is honest enough, however, to name these authors, while many of his colleagues of this and a later period prefer silence on this point. Even the renowned Galen (131–200 A.D.) owes most of his botanical knowledge as presented in "De simplicium medicamentorum" to the materia medica of Dioscorides, which he duly acknowledges. Again, the seven books of Paulus Ægineta (about 600 A.D.) are primarily compilations culled from Galen and Oribasius (about 360 A.D.).

The dental therapeutics as presented by the more important Greco-Roman writers—Galen, Oribasius, Celsus, Aurelianus, Paulus Ægineta, etc.; the Arabo-Persians—Rhazes, Ali Abbas, Abulcasis, Avicenna, and Mesue; the early Germans—Schenck von Grafenberg, Heinrich von Pfolsprundt, and Ryff; the early Italians—Arculanus and Vigo; and the early French—Guy de Chauliac, Valescus, Paré and Houillier; —all, in their final analysis, are culled from Dioscorides. Especially Avicenna (980–1037), "the prince of Arabian physicians," as he has been styled, and whose treatise on general medicine—the "Canon"—for many centuries enjoyed equally as high a reputation as did the works of Galen, and today is still to be found in many homes of Asiatic Turkey, has been a flagrant plagiarist of Dioscorides' dental medicine. And Walther H. Ryff (1500–1572), that "jack-of-all-trades" to whom Haeser refers as "the roving plagiator," compiled his dental medicine from the same source via Arculanus. The dental remedies referred to by that mixture of charlatanism and necromancy, John Gaddesden (about 1310 A.D.), sometime professor in Merton College, Oxford, are so thoroughly tainted by medical avarice, superstition, and ignorance that it would be an insult to the enumerated writers if we place him in the same category. Merely to mention a typical example of the disgusting therapeutic measures recorded in his bizarre tome, "Rosa medicinæ," which has been significantly

dubbed by the illustrious Guy de Chauliac, "Rosa fatua," the following "mixtum compositum" in the form of a decoction which he recommended to be taken against dental podagra (neuralgia), may be cited: The gall of a cow, wormwood, alum, pepper, nutgalls, cloves, pitch, mustard seed, the heart of a magpie, the fat of mice, crow-dung, plantain, and lice.

The famous German "Artzney Buchlein* wider allerlei Kranckheit und Gebrechen der Zeen gezogen aus dem Galeno, Avicenna, Mesue, Cornelio Celso," etc., Leipsic, 1530, is an anonymous compilation which, as far as its pharmaco-therapeutics is concerned, merely exhibits the same stigmata as do the works of the above-mentioned writers, *i.e.* it is an epitome from Dioscorides' dissertations, with slight alterations as a sequence of having passed through the works of the various authors enumerated on its title-page.

In a most interesting collection of Anglo-Saxon manuscripts bearing the quaint title "Leechdoms, Wortcunning and Starcraft,"—which in modern English would signify "Physicians' Prescriptions, the Knowledge of Plants, and Astrology," and which was published some decades ago in London—numerous references relating to the diseases of the teeth are contained. Here, again, one meets with many drugs which are readily traced to a dissemination of dental knowledge by the Greco-Roman military surgeons accompanying the conquering cohorts during their occupation of Britain.

It is probably not amiss to depict at this moment a conception of the practice of medicine, and incidentally of dentistry, as one may gather it from the study of the medical works written during the early centuries of the Christian era. The freeborn Roman looked upon the practice of medicine as a handicraft, the pursuit of which was not compatible with the dignity of a "civis Romanus." The practice of medicine in Rome prior to its invasion by the better educated Greek physicians was carried on by slaves; the larger estates depended on their "servus medicus," a slave who had acquired some routine medical knowledge, or the ills of the subjects of the household were looked after by the patriarchal "pater familias." Some of these latter representatives of lay medicine gathered together quite an extensive knowledge of the healing art, and their recorded experiences furnish some of the most valuable data to the medical historians. Celsus, Pliny, and Cato are elucidative types of Roman lay practitioners, and incidentally are voluminous and fruitful littérateurs on this subject.

To the cultured Romans, who were highly conscious of the blessings of personal hygiene, the demand for the services of some genius who would keep their masticating organs in perfect condition was a matter of necessity. The works of medical writers of this period are filled with innumerable recipes for tooth preparations. The mechanical side of dentistry, which by necessity must have been carried out by specialists, has received its ample share, as is testified by an excerpt from the famous Law of the XII Tables, enacted 450 B.C., which contains the following paragraph: "Neither add any gold [to a corpse], but if anyone shall have teeth bound with gold, it shall be no offense to bury or burn him with it." Numerous specimens of Roman and Etruscan dentistry have been found in burial-places. The great satirist, Martial, has preserved the name of at least one dentist, Cancellius, "who has grown rich like a senator among the grands and belles dames, and who cures the tooth diseases; and how he can extract!"

* Very recently the writer inquired at the libraries of twenty-odd universities of Germany whether there is known a copy of this book still older than the 1530 edition (of Dr. E. C. Kirk's library). The oldest copy, possessed by the Berlin library, bears this imprint: "P. Jordan, Mayence, 1532." The frequently mentioned "Basel, 1490," edition is not catalogued by the "Commission on Incunabulas." Incidentally, it may be of interest to know that among seven-hundred-odd medical incunabulas examined no trace of a specific dental work could be detected.

With the exception of a few monographs the early literature of dentistry is found scattered among the various treatises on general medicine. In the large majority of instances these records are published by medical practitioners, although sometimes by laymen who themselves did not practice the art of dentistry. Prior to the appearance of the work of Fauchard, "Le Chirurgien Dentiste" (1728), who has been significantly styled the "Restaurateur de la chirurgie dentaire," dentistry is not entitled to the cognomen of a "learned profession." In reality it constituted the handicraft of vagabonds who traversed the country from one end to the other, practicing medicine, dentistry, alchemy, chiromancy, and necromancy as occasion demanded, now and again interspersing these with a little pilfering. The professional mountebank who presented himself as a tooth-puller, barber, leech, and theriac vender was a familiar figure in the market-places of the big cities or at the annual fairs of the smaller towns. The extraction of the aching tooth was incidentally an incentive for the sale of some tooth preparation or an amulet for the prevention of the occurrence of pain in the remaining teeth. The "dentatores" or "dentispices" of the Romans, the "cavadenti" of the Italians, the "arracheur des dents" of the French, the "zahnbrecher" of the Germans, and the "kindhart" of the English represented the bulk of our professional ancestors. Henry Chattlee of London published an interesting volume in 1593, in which he describes this latter itinerant tooth-drawer. Usually he was rigged up in a fantastic costume, wearing a cap on which he displayed conspicuously a large leaden brooch, being an effigy of St. George, which was commonly regarded as one of his peculiarities. To signify his profession he had his belt garnished with a string of extracted teeth. Chattlee defines this professional charlatan in the following way: "Gentlemen and good fellows, whose kindness having christened me with the name of Kindhart binds me in all kind course I can to deserve the continuance of your love: Let it not seem strange, I beseech ye, that he that all the days of his life hath been famous for drawing teeth should now in drooping age hazard contemptible infamy by drawing himself into print." The keen-pointed pencil of the satirist Hogarth has left us a barber's sign displayed in that famous thoroughfare Charing Cross (about 1740), with this legend: "Shaving, bleeding, and teeth drawn with a touch. Ecce signum!" In Paris, during the sixteenth to the eighteenth centuries, the "Pont-Neuf" was the common meeting-ground for establishing the "théâtre ordinaire de ces imposteurs," as Fauchard ironically refers to it; and at least one of these "arracheurs des dents," Le-Grand Thomas, as he styled himself, succeeded in being counted among the "Immortels."

Among the ancient writings on dental medicine a most interesting record is available which furnishes a complete and luminous description of the then existing state of dental therapeutics, and which is not duplicated in any other work known to the writer. The book is entitled "The Home Remedies of Pedanios Dioscorides." It comprises the pharmaco-therapeutics of the then known diseases, such as headaches, diseases of the eyes and the ears, the teeth and the gums, the other diseases of the mouth and throat, the diseases of the hair, of the skin, etc. It is rather strange to observe that in the various works of dental history, *i.e.* Carabelli, Geist-Jacoby, Lemerle, Guerini, etc., there is no specific reference found in regard to this important work.

Pedanios Dioscorides or Dioskurides of Anazarbus (Asia Minor) lived during the second half of the first century. Nothing definite is known concerning his life. It seems, however, that at one time he was engaged as an army surgeon, and during his sojourn with the Roman legions visited many countries. As he states of himself, from early youth he was passionately fond of nature study, and his love for botany is largely responsible for his minute and accurate description of the many hundred speci-

mens of vegetable drugs, of which he gives a detailed account in his "Materia Medica." Incidentally, with the creation of this work the term "materia medica" was introduced into general medicine. The volume is divided into five books, and contains nearly one thousand drugs, primarily of the vegetable kingdom, although many animal drugs and quite a few mineral compounds are enumerated.

Dioscorides has depicted the medicinal plants so accurately that with this aid, more than 1900 years later, botanists were able to locate the greater majority of these plants in the respective countries. For more than sixteen centuries this important work has formed the basis of all teachings in botany and pharmacology. It has been translated into most of the languages of the cultured nations, and innumerable editions have appeared. Various epitomes and commentaries of this work have been prepared, and, with the financial aid of crowned heads of Europe, beautifully illustrated editions have been printed. In the various libraries of Europe there are about twelve more or less complete codices (manuscripts) of this work of Dioscorides preserved.

During a careful perusal of this most interesting text, the writer has been able to locate more than one hundred passages referring to diseases of the teeth and their adnexa. Dental historians, when referring to the practice of oral therapeutics of the early Roman period, invariably cite Scribonius Largus as their authority. His "de Compositiones," a medical formulary, written between 40 and 50 A.D., contains several prescriptions for tooth-powders and quite a few drugs which are employed in dental diseases. Compared with the references found in the "Materia Medica" and the "Home Remedies" of Dioscorides relative to dental therapeutics, the formulary of Scribonius Largus is completely outshadowed.

The codex of the "Home Remedies of Dioscorides," of which a reliable German translation has been prepared by J. Berendes—and which has served as the basis of our interpretation—was probably transcribed at the middle of the fourth century. Owing to a few anachronisms and philologic peculiarities, this codex has been branded by some historians as apocryphal. May we not assume that the monkish scribe who copied this codex from a still older manuscript was rather too anxious to bring it up to date? Our interpretation follows the German text almost *verbatim*. In selecting the correct English synonyms for the medicinal substances, the same numerous difficulties were encountered which always confront the student when delving in antique medical literature. The writer gratefully acknowledges the assistance derived from various works on medical and botanical history; nevertheless he realizes the shortcomings of his humble efforts. To do justice to a task of this nature, the combined knowledge of a philologist, botanist, pharmacologist, zoölogist, and mineralogist is necessary—a conglomeration of faculties rarely possessed by one individual.

The Home Remedies of Pedanios Dioscorides.

BOOK FIRST.

The Remedies for the Teeth and the Gums.

Chap. 69. Against the toothache the following remedies, boiled in vinegar, and used as a mouth-wash, are employed, but they have to be used warm and kept in the mouth near the aching tooth as long as possible: Henbane root, Jerusalem-oak root, marshmallow root, pellitory root, petty-whyn root, plantain root, pine splinters, and nutmeg-flower root, larkspur, black hellebore, the root of capers, and the seeds of their pear-shaped fruits, stag's horn raw or burned, sulfur slightly touched by fire, with mild marjoram and pine wood, sweet balm, pennyroyal, leaves and roots of the mulberry tree, polar plant, the seeds of the polar plant with hyssop and figs, pine needles and poplar leaves, the roots of the wild cucumber, the flowering tops of garlic with gum thus (olibanum), spurge, peach stones, nutgalls with salt and gum cedar, each of these (substances) with vinegar. Or: Core a colocynth, and in it boil vinegar and

use it as a mouth-wash; this will force out the decayed teeth. Of service is also the juice of the dead-nettle growing near Mount Parnassus, mixed with brine; the juice of plantain leaves. Furthermore, the following boiled in wine are used in the same manner: Mullein root, the root of deadly nightshade, asparagus root, soda with pepper and rue, the round fruits of the plane-tree, myrtle root, polar-plant juice, dry roses in wine boiled down to one-third. In using, employ them as mouth-washes.

Chap. 70. Diseased teeth will become relieved if the following remedies are chewed or if one bites upon them: The roots of the milk-thistle, the inner part of the nutgalls, the root of pellitory. Powerful service is rendered in toothache by rubbing the painful tooth with the pointed sting (tail) of the skate (fish); the diseased part of the tooth will be destroyed by decay. Some employ it by thrusting it through a tube, believing that this procedure helps to insure freedom from pain.

Chap. 71. The following remedies cure the toothache if placed in the hollow tooth, or if they are placed against the tooth (some remedies will split the tooth or destroy it through decay): Sediment of oil boiled with oil of unripe olives to the consistence of honey—if this is painted on the tooth it will pull it out; crow-foot, prepared in the same manner, disintegrates the tooth; the tear of the grapevine mixed with opopanax and the juice of the polar plant; liquid asphaltum kneaded with soda, pellitory macerated in vinegar for forty days; the tear of the Ethiopian olive tree, the tear of tanner's sumach, the juice of wild and domestic figs, the juice of spurge: on top place wax to close the opening. Galbanum may also be placed about the tooth; gum cedar will destroy the tooth as well as the middle part of the nutgall; the juice of mulberry root; the juice of polar plant mixed with meat stuffed with raisins may also be placed about it, or with wax and rosin, but with sulfur and frankincense it is painted on linen and placed about it. In this same manner opopanax mixed with sandarac[1] is employed; Egyptian sory[2] mixed with rosin; the liver of the lizard placed into it; chucklusa or sulfur or nutgall, in fine powder, mixed with sweet wine; they are placed about the tooth after it is cleansed. Or pepper and saffron mixed with gum turpentine. Or triturate the burned skin of a snake with oil and paint it about the tooth after having previously removed the slime. Or place a mixture of Oriental watercress and mustard about it, or boil fissile alum with honey and rub it on the tooth, or place the skin of a snake about it, or boil finely powdered nutgalls and myrrh with honey and put it into it; or use in the same manner asphaltum, pitch, gum cedar, and fissile alum. Furthermore, galbanum, pepper, mezereon bark; or boil the liver of a frog and tanner's sumach in water to the consistence of honey, strain it, and again boil the decoction to the consistence of a paste and place it in the tooth; or soften fresh wax and place it about the tooth.

Chap. 72. Drop into the ear opposite the painful tooth the juice of teinisse. Further, the juice of fresh watercress; fifteen berries of the golden yellow flowering top of ivy, powdered and warmed in the peeling of pomegranate; the juice of mangold with caraway, powdered skin of the snake, and the same boiled with the oil of rose. If the juice of red chicken-weed is dropped in the opposite nostril it will produce results. It is stated that if the root of watercress is tied about the neck it will alleviate the toothache.

Chap. 73. The toothache will be relieved if one scarifies (the gum about the tooth) and rubs sulfur into it, or molybdæna[3] finely powdered and mixed with wax, or pellitory, macerated in vinegar for forty days; but the other teeth have to be protected by wax. Or mix thoroughly sory with vinegar, or take four drams of sory, six drams of molybdæna and enough gum cedar to make a mass.

Chap. 74. The pain of teething in children and the itching are relieved by butter, if rubbed on by itself, and with honey, the brain of the hare rubbed in, broiled and eaten; mice eaten; they also keep back the freely flowing saliva in children if they are held alive in the mouth.

Chap. 75. Dulness of the teeth is relieved by chewing garden purslane, together with rubbing with oil.

Chap. 76. The teeth are polished with snakeroot, burned stag's horn mixed with a little mastic; white salt mixed with honey

and burned in a pot until charred; the land snail, stuffed with salt and burned, pumice stone roasted and tempered with wine, the mountain snail burned with honey; the Arabian stone(4) burned with honey, burned fresh-water snails, or burned cuttlefish bone. Each of these (substances), on account of its flavor, is mixed with a little spikenard or the flower of Asiatic cornsilk, or burned and finely powdered sheep's wool containing the natural sordes mixed with a little salt.

Chap. 77. Loose teeth and spongy gums are made tight if the following is used as a mouth-wash and kept in the mouth for some time: A decoct of the leaves of the olive tree, ass' milk, the juice of pickled olives, gum myrrh with wine and oil as a mouth-wash, bituminous coal boiled with wine, plane-tree leaves boiled with vinegar, vinegar of squills, chewed blackberries; equally as good is mallow root; iron rust placed dry thereon, in the same manner pomegranate flower, fissile alum and myrrh mixed, or without myrrh with vinegar and honey; further, in the same manner burned sory, gum styrax mixed with salt and placed thereon. Or myrrh, pompholyx(5), starch powder, equal parts, finely powdered and dry. Or pomegranate peeling, nutgalls, chalcanthon(6) mixed with vinegar as a mouth-wash; or ten frogs, one-half chus(7), vinegar, four drams chalcanthon, six drams mandragora root boiled down to one-third as a mouth-wash. For the toothache the following remedy is also of service: Four drams aloes, one dram gum thus, four drams fissile alum, to be mixed with honey and rubbed thereon.

Chap. 78. Against swelling, proud flesh, and gangrene of the gums the following are good remedies as mouth-washes and held in the mouth: The juice of garden purslane, a decoct of the root of tragacanth in wine, the juice of pickled olives, oil pressed from unripe olives, quince oil, and the oil of mastic. To be held in the mouth: Myrrh with wine and oil, gum cedar with vinegar and sediment of oil, also a decoct of nutgalls, a decoct of the bark and the leaves of mulberry, vinegar of squills.

Chap. 79. Dry and applied as a powder: Snakeroot, dry plantain seed, dry satspalathos, burned root of fennel, diphryges(8), copper rust and iron rust, charred chalcanthon, nutgalls, henna, flowers of pomegranate, rose flowers, lycium, dry mastic, mixed with vinegar, misy(9) with vinegar, burned copper with a little arsenic, fresh splinters of mastic wedged between the teeth. The best remedy in case of proud flesh is a fomentation with hot oils; take wool, wind it about a sound and dip it in hot oil, and put it to place until the gums will not turn white any more; by so doing the flux is checked and it will become dry.

Chap. 80. Swelling in and about the gums is cured by all kinds of burned alum or else sory, applied dry and in fine powder.

Chap. 81. If the jawbones are laid bare of flesh the formation of fresh gum tissue is encouraged by applying two parts of rose flowers and one part of sweet-smelling calamus.

Remedies for the Remaining Diseases of the Mouth and Throat.

Chap. 82. Thrush and sloughing ulcers are cured with honey and what has been recommended for swelling and proud flesh of the gums. But excellent in their cure and as specifics are known: The leaves of maiden-hair fern and of henna plant, mixed with honey and rubbed thereon, fumitory; the juice of unripe grapes, also the juice of wild roses and tanner's sumach, especially the sumach which is used as a spice, also the flowers of the wild pomegranate, dry, and in the form of a decoct as a mouth-wash; sandarac with oil of roses as a wash; furthermore, in the same manner, the juice of the garden hyssop and the leaves of the wild olive tree; further, one part of arsenic and three parts of burned paper, apply with honey; in the same manner the juice of plantain and nutgalls with honey, as well as liquid alum as a mouth-wash.

Chap. 83. Stomatitis is cured by the same remedies as advocated for sloughing sores; specific remedies are the following: Ash of the burned roots of wild fennel or burned fish two parts, aloes one part, to be applied dry; or arsenic four drams, burned paper twelve drams, to be applied dry; or raisins deprived of their seeds, bruised, and placed thereon; or the deposits of oil, boiled and painted on; the juice of wood betony.

Chap. 84. Foul odor from the mouth is removed by an infusion or decoct of the wood of aloes to be used as a mouth-wash; further, myrrh, the flower of Asiatic cornsilk or cinnamon when chewed, Indian leaf placed beneath the tongue, vinegar of squills, or a decoct of juniper wood.

Chap. 85. For inflammation of the tonsils we employ a gargle made of fermented honey with a decoct of bran, roses, or lentils, or the leaves of calamus boiled in wine; for ulcerated tonsils, the juice of scammony root, aloes, boiled deposits of oil, as well as salt, lycium, tar, misy, red copper oxid, boiled mulberry juice with honey and a little alum. Good results are obtained with hot almond oil dropped into the ears.

Chap. 90. Swallowed bones or thorns which have lodged in the gullet, you remove by spreading half-melted lard on linen; force it into it and encourage swallowing, and, with a string fastened to it, it is forcibly pulled out; usually, the lodged (pieces) will come away. The same may be done with a soft sponge, or wool, or meat cut up in pieces. But one should let it be drunk with water, or the crumbs of soft bread, or chewed dried figs to be swallowed.

GLOSSARY.

(1) *Sandarac.* Red arsenic sulfite, realgar, As_2S_2.

(2) *Sory.* A mixture of the crude sulfites of iron and copper; atramentum, *i.e.* inkstone.

(3) *Molybdæna.* Most likely a by-product obtained in refining ores containing noble metals; it is a mixture of the oxids of lead and zinc, sand, lime, and other substances.

(4) *Arabian stone.* Most likely meerschaum, an impure magnesium silicate.

(5) *Pompholyx.* The deposits scraped from the smelter hood, probably crude zinc oxid.

(6) *Chalcanthon.* Crude ferric sulfate.

(7) *Chus.* A liquid measure; it equals about one gallon.

(8) *Diphryges.* Dross skimmed from melted brass.

(9) *Misy.* A crude ferric sulfate. As stated by Galen, misy and chalcitis are probably synonyms of the same material.

SOME THOUGHTS ON PYORRHEA ALVEOLARIS.

By EMILIO M. AGOSTINI, D.D.S., New York, N. Y.

A GREAT deal of attention has been given during recent years to the subject of pyorrhea alveolaris, and various investigators and clinicians have advanced new theories and methods of treatment of this disease.

While much light has been shed on the subject, the writer believes that the last word in regard to a complete and effective treatment for this disease is yet forthcoming. A brief survey of this subject, therefore, together with a few comments of a purely practical nature, will not be inopportune at the present moment.

NOMENCLATURE.

Before entering upon a discussion of the subject, the question of nomenclature will be touched upon, as this is a matter which has engaged the attention of the dental profession more than once, and which, moreover, should be settled once for all.

Much discussion has arisen as to the propriety of the term "pyorrhea alveolaris," and from time to time different authorities have introduced new terms in describing this disease. Recently, in a paper read before the First District Dental Society of the State of New York on "Relation of Riggs' Disease and Removable Bridge Work," by Dr. H. T. Stewart, published in the *Journal of the Allied Dental Societies,* December 1913, no less than twenty-six terms for this disorder were enumerated by the essayist. He con-

demned them all, including, of course, the one used in the title of this paper, and declared "Riggs' disease" to be the only real and proper term which should be adopted. This raised a storm of protest from all or nearly all who participated in the discussion at the time. Dr. M. L. Rhein of New York very much resented the omission of his nomenclature, which, he claimed, the late Professor Miller of Berlin had adopted in his "Text-book on Operative Dentistry." As a matter of fact, Dr. Rhein's classification could not properly have been included in the list of terms given, for this classification, as we understand it, merely describes different types of the disease according to their supposed etiology, none of which could properly be selected as representing a common generic term to include every phase or pathologic manifestation of the disorder. The above incident is related simply because therein lies the crucial point at issue. None of the different terms adopted so far have succeeded in conveying the full meaning of this trouble; in other words, none of these terms is more suggestive or symbolic of a definition of the disease as we understand it than is the term pyorrhea alveolaris.

The original term Riggs' disease has been condemned as being unscientific and meaningless. But, hard as our dental philologists may try in their endeavor to find a word which will carry in itself a definition of this affection, we fear they will be baffled in their efforts. Should they find such a term, which could be made as long and as complex as any chemical formula for a new synthetic drug, they will have Luzbel's own task in getting the dental and the medical professions to adopt it. Perhaps the most logical term would be Riggs' disease. It is the oldest, and bears the name of one of the men who first described the condition. It is not unscientific, for we find similar instances of diseases so named from their original investigators. Medical as well as dental literature is replete with instances. To name a few: Bright's disease, always readily understood to mean any one of the different forms of nephritis; Bell's palsy, a paralysis of the seventh cranial nerve; Ménière's disease, vertigo of the internal ear; St. Vitus' dance, or chorea of Sydenham, a form of chorea; Vincent's angina, a form of diphtheroid angina, etc.

It is a most difficult task, however, to pretend to overrule the force of usage, and usage having sanctioned the term pyorrhea alveolaris, we must accept its precept as a final decision.

After all, "What's in a name?" In this case, the term is nothing more than a synecdoche, a figure of speech, which has become common usage in the literature of the world.

TREATMENT BY INSTRUMENTATION.

Turning our attention to the different methods of treatment which have been advocated for pyorrhea alveolaris, we find that the advocates of instrumentation believe that pyorrhea alveolaris is a disease of purely local origin, which has no important bearing whatever on any systemic condition, and the direct inciting cause of which consists in the formation of calcarious deposits upon the crowns, necks, and roots of teeth. The only treatment which they institute is what in general surgery is termed curettage.

After the necessary instrumentation, with the technique of which we are all more or less familiar, washing out of the débris, a few touches of a stone to relieve and correct the occlusion, and the recommendation of some suitable tooth-powder or paste and mouth-wash, the patient is dismissed, and the case pronounced cured. As a precautionary measure, however, these patients are warned that in the course of a few weeks or months and at the end of every such interval, they should receive what is termed a prophylactic treatment. As a matter of fact, such treatment consists, in a good many instances, of another thorough curetting of the pockets, the removal of all calcarious deposits, scraping and polishing of the teeth, a few touches correcting the occlusion, etc.,

for in the interval that has elapsed, some of the old pockets have been reinfected, or perhaps new ones have formed. In other words, there is more or less of an actual recurrence of the disease. Yet it is both interesting and surprising to follow up some of these cases and watch the good results that are obtained by this treatment alone.

MECHANICAL AND SYSTEMIC TREATMENT COMBINED.

The advocates of a combination of mechanical and systemic treatment apparently proceed in a more conservative manner. They claim that pyorrhea is usually a local manifestation of some systemic pathological condition, and that it is intimately associated with many disorders to which the human economy is heir.

Authorities have named so many diseases as the systemic cause of pyorrhea that the most capacious memory would be taxed to retain them. A twofold classification will suffice for our purpose: (1) The diseases of metabolism, such as arterio-sclerosis, Bright's disease, diabetes, gout, uric acid diathesis, acidosis, etc.; also auto-intoxication and the condition more recently described as indicanuria; (2) diseases other than those of metabolic origin, notably syphilis.

These advocates usually consult their patients' family physician with a view to working out a plan of treatment in conjunction with the usual topical curettage. But, alas! this plan, excellent as it may seem, often comes to grief, for either the patient pays little heed to the dentist's advice in this direction, or else, what is more common but none the less unfortunate, the physician, not being inclined to recognize the dentist's point of view, will dismiss the case with a most vague and unsatisfactory report, the result being that the treatment has to be confined mainly to the usual surgical curettage, removal of deposits, scraping and polishing of roots, etc.

VACCINE TREATMENT.

With the advent of this new method of treatment for many of the infectious diseases, pyorrhea alveolaris has received its share of attention, and while not a great deal has been accomplished, it is to the credit of the men who have worked out this method that they have at least given us an opportunity to judge of the results obtained.

The term vaccine therapy is decidedly a misnomer. Neither is the bacterial product injected obtained directly or indirectly from a cow, as the word vaccine —from *vacca,* a cow—would imply, nor is the process in any manner similar to that which is practiced in vaccination for the prevention of smallpox, for we do not scarify the skin and inoculate the patient with the living germs from another animal. However, here again usage has had its way, and the term vaccine therapy will probably continue in vogue. Serum or opsonic therapy would be the correct term to employ.

This therapeutic measure is open to so many objections, it is at best so cumbersome, difficult, costly, and slow in its administration, so vague and indefinite in its results, that it has been more or less of an adventure, and then a disappointment. The main objections to it may be briefly summarized as follows:

(1) It is necessary to have at our command the services of a trained and skilful bacteriologist to study the opsonic index and then cultivate the specific germ or germs responsible for the infection.

(2) Those germs that have been found by investigators of this method to predominate in pyorrheal pockets have been the staphylococcus and the pneumococcus. Vaccines have, therefore, usually been prepared from cultures made from these two forms of bacteria only. But more recent investigations have disclosed the fact that there is one other form of micro-organism which seems to make a constant habitat of pyorrheal pockets, and of whose activities we shall speak later on. Hence the findings of the former investigators cannot, after all, be considered to have been very accurate in this respect.

(3) After the proper culture has been prepared, its administration must be

carried on very cautiously, for an overdose injected, for example, during the period of the so-called "negative phase" in the opsonic index, when the vitality of the tissues is very low, may bring the treatment to an abrupt failure. This is well known to have happened in general medicine, and a case of pyorrhea which came under the writer's care about a year ago may serve as an example:

The patient, Miss D., age twenty-six years, presented herself for treatment of a pyorrhea of which she had been conscious for about two years. The family history was negative, so far as could be ascertained. Blood and urine were normal. All her gums were very much inflamed, and there was an abundant flow of pus from almost every socket. The regular topical treatment was instituted with extreme care and interest, the patient being a young woman with an otherwise fine set of teeth, and her mother was in great distress over her condition. Every tooth and surrounding tissue thereof responded well, with the exception of a lower left molar which continued to discharge pus, and was giving the patient much discomfort. Vaccine therapy was then resorted to. A smear was taken from this tooth and the culture examined. The report showed a mixed infection of such character that her physician used a stock vaccine. A few days afterward the tooth became so much worse that it had to be extracted. Whether this retrogressive reaction was due to the vaccine treatment or to some other ulterior cause I cannot, of course, positively assert.

(4) The clinical results of vaccine therapy obtained even by its most enthusiastic sponsors have not been very convincing. Reference should be made here to two of the most important communications upon this subject.

Of the first one, entitled "The Treatment of Pyorrhea Alveolaris by Bacterial Vaccines, and the Results of Animal Experimentation," by George B. Harris, Detroit, Mich., published in the DENTAL COSMOS, April 1913, p. 388, part of the first paragraph will be quoted:

I am not attempting to belittle the local treatment for pyorrhea in any way, shape, or form. Local treatment is of vital importance in the treatment of this disease. . . . The removal of calcarious deposits is of vital importance, and the gums must be kept from coming in contact with them at all times. Unless this is done, the gums cannot resume a healthy condition, and our best efforts in any other direction will be wasted.

The second paper, a more elaborate contribution, entitled "Pyorrhea Alveolaris: Treatment by the Opsonic Method," by Theodore C. Beebe, M.D., Boston, Mass., published in the DENTAL COSMOS, May 1913, p. 475, gives a full description of the method and much clinical data. Let us also transcribe the final words of the final paragraph:

Judging from the results so far obtained in all stages and degrees of pyorrhea, it is apparent that we now have at our disposal a method of treatment which, *though often slow*, is constant in its good results, "especially when combined with *thorough dental treatment*" [italics the writer's].

It is significant to note that both these writers advocate the good old surgical curettage which has, after all, to be resorted to in order to obtain results, and, to use the common but wholesome expression, "Results are just what counts."

EMETIN TREATMENT.

More recently several investigators have centered their attention on a specific germ, a parasitic protozoan, for years a well-known invader of the lower digestive tract, the endamœba, which they claim prevails more than any micro-organism in and about pyorrhea pockets, and is considered more than any other agency responsible for this disorder.

This fact being established, a specific drug of well-known endamœbacidal properties is given as the treatment *par excellence,* this drug being ipecac and its alkaloids emetin and cephalin.

In discussing this phase of the subject, reference will be made only to the joint report of Dr. Bass and Dr. Johns of New Orleans, as published in the *Journal of the American Medical Association*, February 13, 1915.

Criticism also will be confined chiefly to certain salient features of the report, viz:

(1) There is a general impression left

by the writers to the effect that the one and only positive cure for pyorrhea has been found in the administration of emetin, which should kill all endamœbas present in the mouth in a short time, and restore conditions to normal.

(2) No reference is made all through the lengthy paper as to any other treatment in conjunction with the one above mentioned, except three lines of a small paragraph in which slight mention is made of local instrumental treatment by the dentist.

(3) The most significant feature of this joint report, however, is the oft-repeated assertion that *it takes weeks or months* for the lesions to heal, and that during this interval reinfection occurs quite frequently. The emetin treatment, though, cannot be kept up for more than a few days.

Here we have two contradictory elements which leave upon our minds, after the perusal of the paper in question, a peculiar impression akin to doubt; first, as to the apparent confidence in the success of the treatment advocated, and then as to the feeling of failure which runs through its lines, and which finds expression in the three paragraphs already mentioned, which may be condensed in these words—"It takes *weeks and months* for the lesions to heal; and during this interval reinfections are frequent."

If, as can be reasonably assumed, Dr. Bass and Dr. Johns applied no other than this emetin treatment in the great number of cases reported, it is small wonder that there were so many relapses, and that it took months in a great majority of cases to effect a cure or an improvement.

It is hard to reconcile the above fact, of these writers' confining their efforts to the employment of this one drug as the sole treatment of their cases, with the following statement written in the same article, which we shall quote *verbatim:*

> It is not at all probable that endamœbas can attack the normal tissue. Damaged tissue is necessary, very likely, and it is highly probable that the injury should furnish a kind of pocket or closed ulcer. These endamœbas are not known to live on open surfaces. Any trauma, such as wounding the edge of the gum with a toothpick, hard particles of food, etc., or the condition that would result from hard particles being forced between the teeth and making long-continued pressure on the soft tissues, or the pressure of ill-fitting crowns, would offer favorable conditions for establishing the endamœbas.

If the process is as above described, and it is an established fact that an injury is needful in order to produce endamœbic invasion, then why not remove the irritant which produces the injury and then kill the endamœbas, or reversely, if you choose, kill the endamœbas first, and then by all means remove the irritant? And is it not logical to suppose that by this practice the great majority of these cases would then not be reinfected so quickly as the report shows?

Criticism of the question of the pathogenicity of the endamœba buccalis has purposely been withheld in the present article, as this in itself presents a problem which is open to future debate and on which it would be rather premature to advance an opinion.

CONCLUSIONS.

From the foregoing survey, we may now recapitulate.

These, then, are the cold facts laid bare. We have to deal with a disease which is the very embodiment of failure.

Its name is a failure.

The surgical treatment is a failure.

The combined treatment is a failure.

The vaccine treatment has been a failure.

Lastly, the emetin treatment: Is it also going to be a failure? Time and test alone will answer this question.

Yet we must not falter. We must face the problem that confronts us. We must make strides toward ideally hygienic conditions in the oral cavity; for the perils of oral sepsis and its far-reaching consequences upon the general system are staring us full in the face!

We must consider pyorrhea alveolaris

to be, rather than a distinct disease, an aberration, a perversion of nature; a symptom complex presenting a great variety of conditions and phases, each case presenting its own distinctive features. If we are to accomplish results in combating this disease, we must plan our attack from every possible angle. This does not mean that we should employ a gunshot, haphazard method, but we must remember that, with very few exceptions, it is impossible to single out our cases in the way in which they are so beautifully well depicted by most authorities and text-books upon this subject, especially as concerns the etiology.

The great fundamental error lies in the fact that we are too often carried away by our enthusiasm over a certain therapeutic procedure, and confine our efforts to that particular one alone. It is in this fact that we may perhaps find a reason why our results are so often fraught with failure.

An early diagnosis is very important, for as soon as the disease becomes deep-rooted, more or less destruction of both the soft and hard tissues takes place, and we know full well that, no matter how successful our treatment may be, the tissue once lost, especially the hard bony structure, can never be reconstructed. These mouths will always offer a favorable soil for reinfection.

The writer has always been more or less interested in pyorrhea, but within the last three years has given the disease considerable attention and careful thought. He is of the firm opinion that, as thorough cleanliness of the oral cavity stands out pre-eminently as the most effective measure against the prevention of caries, even after years of investigation and research, so, in the treatment of pyorrhea alveolaris, curettage has been and is the therapeutic measure which has stood the test of every observer and investigator. It is the one logical measure to adopt, first, last, and always, no matter whether we are going to institute this or that other scientific treatment, even when the condition does not show the presence of tartar as having been one of the inciting causative factors.

Finally, intractable as pyorrhea alveolaris may be considered to be by many, it should be our plain and unshirked duty to endeavor to cure every case intrusted to our care with all the means at our command and to the best of our ability; and whenever it is deemed necessary these cases should be referred, if possible, to specialists who, by devoting their entire attention to this work, have developed unusual ability and skill in treating the more advanced and obstinate cases. We should not be over-skeptical, and every new method should be given a fair trial. And while conservative in our prognosis, we should be optimistic and encouraging toward our patients, for there is no doubt that the most stubborn cases can at least be improved with careful and judicious treatment.

THE PRESENT STATUS OF ADENOID AND TONSIL OPERATIONS.

By CARL W. WALDRON, M.B.(Tor.), D.D.S., Baltimore, Md.

(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, at its quarterly meeting, January 30, 1915, at Baltimore, Md.)

THE subject before us tonight is somewhat timeworn, but in view of the reaction against the wholesale operations performed upon the tonsils during the past four or five years, it behooves us to reconsider the entire question.

FUNCTIONS OF THE TONSILS.

The functions of the tonsils have been reviewed by Comroe.* Briefly they are as follows:

(1) *Protective.* The protective function of the tonsils is exercised by means of the phagocytic action of leucocytes, which traverse the tonsil to the oral cavity in great numbers. These cells form salivary corpuscles. Adami and Nicholls conclude that the tonsils themselves are to a limited degree phagocytic through their lymphoid cells. Allen, Kayser, and others state that the tonsils undoubtedly form lymphocytes in the germinating follicles. These cells infiltrate the crypts and escape in large numbers into the oral cavity, becoming an important source of the salivary corpuscles.

(2) *Compensatory.* Ashby, in an analysis of three thousand cases of enlarged tonsils and adenoids, concluded that they enlarge in order physiologically to augment the lymphoid tissues of the body.

(3) *Defense against absorption.* This function of the tonsils has been demonstrated experimentally by Hodenphyl, Labbé, and Sirugue, and exhibited clinically by Jacobi, Frankel, and others. This function is dependent upon normal intact mucous membrane of the tonsillar surfaces and crypts.

Other functions which have been brought forward are—

(4) *Production of immunity.* This is done by a process of continual autovaccination, thus protecting the body from chance infection. This theory has been advanced by Digby and Packard.

(5) *Internal secretion.* This function has been advanced by Escat, Allen, Masini, and others.

(6) *Lubrication of the throat.*

(7) *Acoustic and phonetic functions.*

INDICATIONS FOR TONSILLECTOMY.

In the face of this evidence of important tonsillar functions, what are the indications for tonsillectomy? The purely local conditions may first be considered. Tonsils may become so large that they may meet—when not only is respiration interfered with, but swallowing may at times be difficult. In these cases, there may or may not be an enlargement of the glands of the neck. When present, their diminution in size or disappearance, which usually takes place within from six to twelve months following tonsillectomy and adenoidectomy, seems sufficient evidence that the tonsillar hypertrophy is not compensatory in order to augment the lymphoid tissues, as stated by Ashby. I do not consider enlargement of the tonsils a sufficient indication for their removal, except when they are so large that they mechanically interfere. A careful history must be taken to determine the probable

* Comroe: "The Use and Abuse of the Tonsils," *Journ. A. M. A.*, October 17, 1914, p. 1367.

effects of disease of the tonsils upon the general health of the individual.

CHRONIC SORE THROAT; ACUTE TONSILLITIS OR PERITONSILLAR ABSCESS.

In the presence of chronic sore throat, definite attacks of acute tonsillitis, or peritonsillar abscesses, it is of prime importance that a careful dental examination be performed before operation is undertaken. Gingivitis, carious teeth or roots, or alveolar abscesses about permanent or deciduous teeth may be the primary foci of acute or chronic tonsillar infections. When neglected, these conditions account for many cases of chronic sore throat, laryngitis, and even bronchitis, which sometimes follow tonsillectomy. In the absence of enlarged glands of the neck, operation may be deferred, and preliminary treatment be undertaken to put the mouth in a hygienic condition. In this connection, the statistics of Odenthal and of Hoppe are most interesting. Some twelve hundred children were examined, and enlarged glands of the neck were found in seventy per cent. of those examined. Carious teeth were present in most of the latter cases. Odenthal found that, when dental caries existed on both sides, glandular enlargements were also present on both sides. The percentages of cases with carious teeth, but without glandular enlargement, were seven and twenty-one per cent. respectively. I have not found carious teeth associated with cervical adenitis in such a large proportion of cases. Of one hundred consecutive cases with distinct enlargement of the cervical lymph glands, it was found that carious teeth were present in forty-five. These included both public and private ward patients, chiefly children.

It would seem, therefore, that the presence of enlargement of the cervical lymph glands is the most important index of tonsillar infection. Examination of the tonsils may reveal signs of infection, such as marked congestion, purulent or caseous exudate in the crypts, or injection and adhesions of the pillars. The size of the tonsil is of but little importance in determining the advisability of operation.

Some children have periodic attacks of fever and mild illness not accompanied by sore throat. During these attacks, the mothers may notice swelling of the glands of the neck. In the intervals between attacks, these glands may or may not be enlarged. It has been our experience that gain in weight and general improvement in health follow tonsillectomy in these cases.

RELATION BETWEEN TONSILLAR INFECTION AND TUBERCULOSIS OF GLANDS OF THE NECK.

The relation between tonsillar infection and tuberculosis of the glands of the neck is of great importance. This subject has been carefully reviewed by Ingals.* It seems that among observers there is no great unanimity of opinion. However, it may be safely stated that—

(1) Tuberculosis of the tonsil may be demonstrated histologically in some two to five per cent. of tonsils removed by operation.

(2) Tuberculous glands of the neck are found more frequently than tuberculous tonsils. It has been demonstrated by Wood that the tubercle bacilli may pass through the tonsil, producing tuberculous adenitis without producing any evidence of tuberculosis of the tonsil itself.

(3) Tuberculosis of the tonsil without appreciable glandular enlargement has been reported by Sewell.†

(4) Tuberculosis of the tonsil is usually secondary, but may be a primary infection, especially in children.

(5) Ingals states that there is no direct connection between the cervical lymph nodes and the pulmonary lymphatics, and, therefore involvement of the lungs associated with cervical ade-

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* Ingals: "What Relation, If Any, Have the Faucial Tonsils to Pulmonary Tuberculosis?" *Journ. A. M. A.*, July 12, 1913.

† Sewell: "Histologic Examination of the Faucial Tonsils with reference to Tuberculosis." *Journ. A. M. A.*, September 9, 1911.

nitis must be a systemic infection rather than a disease of the lymphatics.

(6) Tuberculous glands frequently subside permanently following tonsillectomy, and even when recurring or enlarging, show a greater tendency to heal, and the individual enjoys better health following the operation.

Richards* recommends that in all cases of cervical adenitis, the tonsils be removed as the first procedure. If the glands are broken down and an operation on them has to be performed, the tonsils should be removed at the same time. He does not think it probable that all enlarged cervical lymph glands are tuberculous, but that presumably about eighty per cent. of them are. In a review clinic it was found that the cervical lymph glands were, as a rule, felt not at all, or only to a slight degree. Many of these children had enlarged lymph glands at the time of operation. This has been our experience. Some fifteen or more patients with marked unilateral cervical adenitis, undoubtedly tuberculous in nature, have had tonsillectomy performed. This has apparently been of benefit in every instance, although in many the interval of time is not yet sufficient to determine final results.

It is quite certain that no definite information can be derived from the appearance or size of the tonsils as to their tuberculous nature.

SUPPURATIVE CONDITIONS OF THE MIDDLE EAR.

In chronic suppurative conditions of the middle ear it is of prime importance to establish normal nasal breathing, and to put the naso-pharynx and pharynx into as healthy a state as possible. Tonsillectomy and adenoidectomy is followed, in many cases, by cessation of the aural discharge. It has also been of marked benefit in children who have been subject to frequent recurrence of acute otitis media, or to frequent acute exacerbations of a chronic middle-ear condition.

CHRONIC PURULENT SINUSITIS.

It has not been our experience that chronic purulent sinusitis has cleared up following tonsillectomy and adenoidectomy, as stated by Beck.* We have rather been led to believe that tonsillar infection, in many instances, is secondary to that of a nasal accessory sinus. Yet many young children are seen with a profuse nasal discharge of mucus, which is probably due to an ethmoiditis. This condition is frequently completely relieved by the removal of a large mass of adenoids, together with the tonsils. The cessation of the discharge is probably due to the improved aeration and drainage.

ASTHMA AND HAY FEVER.

Asthma and hay fever in children present a problem to the internist and the nose-and-throat specialist. The studies of protein toxins, anaphylaxis, carbohydrate intolerance, reflex irritation from nasal and throat conditions, have been numerous and of great importance. Dick and Burmeister† injected triturated tonsillar tissue into animals to determine its toxicity, and are of the opinion that such conditions as asthma and convulsions may be produced through the agency of the tonsils. In many of these asthmatic children, the nose may present a normal appearance, with no history of sore throat, and objectively but a moderate amount of adenoid tissue to be seen. The question of tonsillectomy arises, and one may be guided by the presence or absence of cervical glandular enlargement as an index of the tonsillar infection. Operation in these cases, together with careful attention to the diet, has resulted

* Richards: "Relation of the Tonsils, Adenoids, and other Throat Conditions to Tuberculous Cervical Adenitis." *Boston Med. and Surg. Journal*, January 7, 1915.

* Beck: "Chronic Focal Infection of the Nose, Throat, Mouth, and Ear." *Journ. A. M. A.*, November 7, 1914.

† Dick and Burmeister: *Journ. Inf. Diseases*, September 1913.

in marked improvement in the general condition of the patients.

RELATION OF TONSILLAR TO GENERAL INFECTIONS.

These borderline conditions lead us to the most interesting phase of the question, the relation of tonsillar infections to general infections. The close relation between acute tonsillitis and acute rheumatic fever has been well known for many years. That acute nephritis may follow acute tonsillitis has also been recognized, but not sufficiently emphasized, many cases being undiagnosed. In others, there may be an endocarditis, concomitant with joint involvement, or without manifest articular symptoms. Pericarditis also has been met in association with acute follicular tonsillitis. The intimate relation between chorea, endocarditis, rheumatic fever, and tonsillitis has been long established.

Hunner* has called attention to the occurrence of urethritis in association with tonsillitis, and reports benefit following tonsillectomy.

Six cases of acute thyroiditis following tonsillitis were reported by Theisen† in 1913.

A consideration of the epidemics of streptococcic sore throat of milk-borne infection in the cities of Chicago, Boston, and Baltimore is most profitable. The striking similarity of the complications—cervical adenitis, otitis media, skin eruptions, nephritis, myocarditis, endocarditis, pleurisy, pneumonia, and peritonitis—with the recovery of a hemolytic capsulated streptococcus from fauces, suppurating glands, peritoneum, and blood, all add their quota of evidence that the tonsils are an important gateway to general infections.

Other conditions that have been ascribed to tonsillar infections are iritis, keratitis, neuritis, pleurisy, phlebitis, osteomyelitis, appendicitis, and orchitis.

When a general condition such as arthritis or endocarditis follows definitely an attack of acute tonsillitis, tonsillectomy is advisable after a sufficient interval of time has elapsed. Children with chronic endocarditis, chorea, nephritis, or arthritis frequently come for advice, and the question of tonsillar infection as a possible focus arises. The clinical and experimental work of Rosenow and of D. J. Davis is of great importance. The production of arthritis, endocarditis, and gastric ulcers by the injection of streptococci obtained in pure culture from the deeper portions of tonsils—the possibilities of transmutation, as demonstrated by Rosenow, have been a distinctive advance in the study of these conditions. When patients suffering from these conditions present themselves, an accurate history must be taken, and a most careful and complete examination must be made. Infection of the nasal accessory sinuses, middle ear, mastoids, and teeth should be ruled out, radiographs being taken, if necessary. The appearance of the tonsils, together with the presence or absence of enlarged glands of the neck, will determine the advisability of tonsil operation, even in the absence of any history of sore throat.

CASE REPORTS OF ASSOCIATION OF GENERAL INFECTIONS WITH ADENITIS AND TONSILLITIS.

The following case reports show the association of arthritis, endocarditis, chorea, and nephritis with cervical adenitis and chronic tonsillitis. They are typical of many cases in which the question of tonsillectomy arises. Unfortunately, one cannot determine beforehand the probable effect of the operation upon these conditions; yet one is justified in removing a focus of infection which may be the underlying cause of the progressive tendency of the disease or the recurrence of acute attacks. Fortunately, these patients take anesthetics well, and the postoperative course is but rarely complicated. The improvement in general health is sometimes most striking, even

* Hunner: "Chronic Urethritis and Chronic Ureteritis Caused by Tonsillitis." *Journ. A. M. A.*, April 1, 1911.

† Theisen: *Albany Med. Ann.*, 1913, xxxiv.

when no definite change in the heart or other conditions may be demonstrated. I am indebted to Dr. S. J. Crowe for the opportunity to report these cases.

Case I. S. M., age fourteen, was admitted to the medical service, complaining of pain, swelling, and tenderness of several joints. For three years there had been numerous periods when various joints had been swollen and tender. These attacks had been accompanied by fever. He had been subject to frequent sore throat and swelling of the neck. Examination showed swelling and tenderness of the right wrist and hand, impaired and painful motion in many joints, an enlarged heart, mitral insufficiency, and a low-grade nephritis. There was marked enlargement of the cervical lymph glands; the tonsils were enlarged and congested. The tonsils and adenoids were removed, and the carious roots of a lower first molar extracted.

Case II. M. A., age nine, had a history of acute tonsillitis, occurring each winter for several years past. She had had attacks of chorea at four, seven, and eight years of age. Eight months before operation she was admitted to the hospital with acute rheumatic fever, which resulted in enlargement of the heart and a systolic murmur. The cervical glands were markedly enlarged, and the tonsils moderately hypertrophied. Following tonsillectomy, her general health and physical condition improved, though fifteen months later she developed a mild chorea involving one hand.

Case III. M. P., age ten, had been admitted twice to the children's department with acute rheumatic fever. Her knees, shoulders, elbows, and fingers were involved in the last attack; her heart was enlarged, an organic murmur present, and a pericardial effusion was shown by the X-ray. There was no history of tonsillitis nor sore throat. The presence of a definite cervical adenitis determined operation, which was followed by gain in weight and improvement in health.

Case IV. E. T., age six, came to the hospital complaining of her "heart beating fast, and a cough." She had had occasional sore throat, but no history could be obtained of rheumatic fever or chorea. The glands of the neck were enlarged, and the tonsils markedly hypertrophied. There was enlargement of the heart and mitral insufficiency. Operation in this case was followed by improvement in her general condition, though for a short time there was some increase in her symptoms.

Case V. S. S., age twelve, was admitted to the medical service, where a diagnosis of chronic nephritis was made. He was undernourished and anemic. No cause for his nephritis could be found, aside from small, embedded, infected tonsils. The cervical glands were enlarged. There was no history of sore throat. Following tonsillectomy, the urinary findings showed improvement in the renal conditions. Fourteen months later the child's health was excellent, he had gained in weight, there was no anemia, and the urine was quite normal.

FATALITIES AND COMPLICATIONS DUE TO TONSILLECTOMY, AND PRECAUTIONS.

Comroe (*loc. cit.*) states: "Although a large number of deaths, complications and sequelæ never reach the medical press, very recent literature from the pens of skilled and experienced specialists gives evidence of many deaths and complications resulting from serious hemorrhages, local traumatic disturbances, gangrene, diphtheria from auto-infection, infections of the middle ear, surgical shock, asphyxia, hyperpyrexia, general septicemia, surgical emphysema, pulmonary infarct, septic infection of the lungs and its serous membranes, and also of the cervical glands, tuberculosis, status lymphaticus, and serious disturbances of the nervous system." Such complications are reduced to a negligible minimum by careful physical and urinary examination before operating, proper preparation of the patient, the induction of a light, continuous anesthesia, a complete exposure and control of the field of operation, the use of sharp dissection, thus minimizing trauma, and the surgical control of all hemorrhage by ligation.

ADJUVANT DENTAL TREATMENT.

As already intimated, we remove at the time of operation such carious deciduous teeth or roots as seem beyond treatment. Teeth with large cavities involving the pulp chambers and with alveolar abscesses are also extracted. This of course applies to public-ward cases,

many of whom would not consult a dentist or go to a dental college for treatment. It is advisable that private patients visit their dentist for any dental treatment necessary, before tonsillectomy is performed.

INDICATIONS FOR ADENOIDECTOMY.

In the absence of indications for tonsillectomy, should adenoidectomy alone be performed? Granting the absence of cervical adenitis and a definite history of sore throat, it should be performed for the following indications:

(1) *Mouth-breathing,* with its consequent impairment of health, lassitude, arrest of growth, frequent colds, cough, etc. The previous nasal examination will determine the advisability of crushing outward the inferior turbinates at the time of operation, according to Killian's procedure.

(2) *Intermittent or increasing deafness.* Even when impairment of hearing of the child cannot be satisfactorily demonstrated, the appearance of the tympanic membrane may indicate a chronic inflammatory condition of the Eustachian tubes. These conditions are usually greatly benefited by complete removal of the adenoid tissue and the mucous membrane from which it arises.

(3) *Asthma, stammering, laryngismus stridulus, chorea, nocturnal enuresis.* All of these, and even convulsions and epilepsy, have been attributed to the presence of adenoids. Undoubtedly some of these conditions have been helped by adenoidectomy, and adenoids should be removed, if present, but not with the assurance that the general condition will be benefited.

CO-OPERATION BETWEEN PEDIATRICIAN, DENTIST, AND LARYNGOLOGIST URGED.

In conclusion, I would urge a more complete co-operation between the pediatrician, dentist, and laryngologist. This would be of great value in the study of the relation of diseases and conditions of the mouth, nose, and throat to one another and to the general health of the child. The present medical school inspector's diagnosis of "enlarged tonsils" is not pathological, and should be supplanted by a thorough physical examination, and an accurate history, taken before operation, is advised. Finally, following operation, every effort should be made to keep in touch with the patients, in order to determine as far as possible the ultimate results.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

THE CAUSE OF DISCOLORATION OF SUPRARENIN HYDROCHLORID.

By J. L. ELPHINSTONE, D.D.S., L.D.S., Aberdeen, Scotland,
MEMBER OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

SINCE writing the article on "Sterilizing the Hypodermic Syringe by Boiling," published in the DENTAL COSMOS, May 1915, page 505, it has occurred to me that the action of alkalis on suprarenin has never been properly worked out, but the following extract from the *Pharmaceutical Journal* of March 13, 1915, presents in an easily comprehended manner the conditions under which decomposition takes place. It is from a note by Mr. W. McAdie, Ph.C., Royal Free Hospital, London, W. C.:

> In my opinion, the prime cause of the discoloration of sodium salicylate seems to be due to traces of free ammonia in the air, and has very little connection with oxygen, though

oxygen might be a factor secondary to ammonia.

At the Royal Free Hospital we keep sodium salicylate solution in a two-gallon (glass) barrel which is not very tight at the top; it always became discolored long before it was used.

Some years ago I adopted the expedient of floating a small evaporating basin on the surface of the solution inside. In this basin I placed a flat piece of cotton saturated with acetic acid. The basin floats in the solution and "grounds" on the bottom when the solution is used up. Since that time the salicylate solution has been white until the last drop. It is obvious that the acetic acid merely absorbs the ammonia, and not the oxygen. I have not tried this device with sodium salicylate and alkali solution, but I have no doubt of the result. Some years ago I showed that the coloration of adrenalin (suprarenin) was due to the same cause, viz, ammonia, and that the prevention of coloration was merely a question of the maximum of acid that could be added without interfering with its therapeutic use. It will be noticed that it contains a phenolic grouping very similar to that of salicylic acid.

In a letter I received from Mr. McAdie, he says:

To give you an idea of the instability of the free base adrenalin, it is sufficient to say that if you drop a grain of the dry powdered base into tepid water it becomes immediately brown and decomposed, so that in making the solution you must add the acid to the water, and then the adrenalin; if you reverse it you will spoil the whole solution.

What happens is this: The base adrenalin unites with sufficient hydrochloric acid to form a salt, adrenalin hydrochlorid, leaving over a sufficient surplus of acid to neutralize the alkalinity of the top water, and also any free ammonia from the air. Whenever that surplus is just neutralized by ammonia, decomposition sets in at once. It is noteworthy that the ammonia need not necessarily be from the air, but may be generated by the fermentation arising from the small amount of animal débris which always accompanies natural adrenalin.

From the above hints it seemed that ammonia is the immediate enemy of suprarenin, and that sodium carbonate or sodium bicarbonate becomes inimical in proportion as it liberates ammonia. A little excess of ammonia solution was accordingly added to some solution of suprarenin hydrochlorid 1:1000. The solution, which before was water-white and clear, immediately colored, and assumed a beautiful rose tint.

To another portion of the same suprarenin hydrochlorid solution a portion of the liquid from the sterilizer was added. This liquid would contain sodium monocarbonate only, after its prolonged boiling. No precipitate was thrown down, leading to the conclusion that suprarenin

carbonate is somewhat soluble in water, sufficiently so for our purpose. Further, discoloration only became apparent after standing a considerable time; the discoloration began at the top of the open vessel and worked down; in an hour, the discoloration was only moderate.

We can therefore conclude that the discoloration was caused by ammonia, which only slowly became available, and the action of which would be practically excluded within the hypodermic syringe, which would not be filled more than two minutes previous to use.

It remained next to try McAdie's experiment. A little solution of monocarbonate of sodium, the sterilizing fluid, was poured into a test tube. In the center of this tube was suspended from the top a string moistened with

acetic acid. (See figure.) After it had stood some time, so that the atmosphere of the tube was saturated with acetic acid, solution of suprarenin hydrochlorid 1:1000 was added.

The contents of the tube remained colorless when examined after many hours, although a similar tube without the acetic acid string had become red in color.

This seems to prove that the color is due to the action of atmospheric ammonia which only slowly becomes available, and the result produced within a few minutes seems to be quite negligible.

ETIOLOGY OF SYMMETRY IN DENTAL CARIES.

By I. B. HOROWITZ, D.D.S., New York, N. Y.

IN the March issue of the Cosmos, Dr. I. S. Wechsler calls our attention to the prevalence of symmetry in dental caries, this symmetry being found mostly in the two segments of the same jaw, though not infrequently also in opposing teeth of the upper and lower maxillæ. This statement seems correct to some extent, but the writer's "probable etiology" is utterly unacceptable.

Dr. Wechsler states that deciduous teeth show a greater tendency to symmetry in caries than permanent teeth. We all know that posterior teeth are earlier and more frequently attacked than anterior ones; we also know how few children of the present generation are immune to dental caries. At an early age, almost all their posterior teeth show signs of this disease; so that a good many cases of symmetry are merely accidental, and due solely to great frequency of caries, limited, in many cases, almost entirely to the molars. As very often nearly all the molars are affected, it is easy to notice this symmetry in caries. It is true, as Dr. Wechsler states, that decay in corresponding teeth will often start at the same point—for instance, the mesial surface. But this cannot be attributed to trophic causes, as I shall show later.

Furthermore, the existence of trophic causes of symmetric caries would not imply symmetry as to the point of starting of this dental disease. The causes are not so obscure and deep as Dr. Wechsler thinks. It is well known that amelification goes on simultaneously in corresponding teeth. Any cause, such as a weakened condition of the pregnant mother, causing interrupted nutrition, will affect equally all teeth undergoing amelification at a given moment, causing symmetric malformations which will invite caries symmetrically. Dental caries may not be dependent upon structural defects of dental tissues, but such defects afford better opportunity for the bacteria to do their work of destruction, being a local predisposing cause. Peculiarities of this character are evident not only in two corresponding teeth of the same patient, but in the teeth of several members of a family.

Of the permanent teeth, Dr. Wechsler writes, the lower first molars are most frequently affected symmetrically. This is quite possible, but, if trophic causes lie at the bottom of this condition, why are first molars more frequently affected symmetrically than the second molars? It is evident that all teeth are equally under control of the central nervous system. We must, then, look in another direction for an explanation of the prevalence of symmetry in caries in lower first molars. These teeth,

as a rule, make their appearance some time before the upper ones. It is therefore reasonable to assume that the lower first molars will be affected earlier, on account of their earlier eruption. Youth is the period of greatest susceptibility, and an interval of a few weeks between the eruption of lower and upper molars may be responsible for the symmetry in caries of the lower first molars.

IMPOSSIBILITY OF TROPHIC CAUSES.

It is now conceded by almost all authorities that enamel contains no organic matter, except, perhaps, in fissures near the dentin. The outer surface of enamel is *dead matter,* and could not, once formed, be influenced by trophic or any other kind of nerves; hence symmetry of caries could not be attributed to sympathy. Pathologic changes occurring in other parts of the body, as, for instance, in the eyeballs, cannot be compared to caries of teeth, inasmuch as the eyeballs are under direct control of the central nervous system, while the outer surface of enamel is certainly under no such control, so that a decayed tooth could not, through sympathetic channels, cause the decay of another tooth. If sympathetic caries should be a fact, sympathetic odontalgia would also exist, *i.e.* an aching lower right first bicuspid would cause pain in the corresponding left tooth. This, however, does not happen. The pain patients experience in the entire right or left half of the head on account of one affected tooth is of reflex, and not of sympathetic character.

CONCLUSION.

Symmetry in dental caries is noticed more frequently in deciduous teeth, on account of the great prevalence of this dental disease, affecting mostly the molars, of which in children there are only two in each arch; it is, therefore, in this case at least, accidental symmetry. Symmetry in both deciduous and permanent teeth is also due to symmetric structural defects, anatomical or histological, of embryonic origin.

Trophic influences cannot cause caries through sympathy, as enamel is not subject to such influences. To admit that caries develops through sympathy, is to return to the old vital or inflammatory theory of caries, according to which there is a central and a peripheral caries. Only when we accept the central caries theory could we accept trophic influences as a cause of decay, as the nerve filaments do not reach the surface of enamel. Dr. Wechsler's suggestion could at best be applied to some animals in whom the enamel is mixed with dentin.

Therefore no tooth or root should be sacrificed in order to save the symmetrically situated member, though one eyeball may be excised to save the other eyeball. In obturating cavities or extracting useless teeth we should be guided by the ordinary reasons only. Further research may yet bring to light other causes of symmetric caries, if such caries is really so frequent that it deserves attention, but trophic causes cannot, by any stretch of the imagination, be considered as a cause, in view of the structure of enamel.

SCHOOL DENTISTRY.

By FREDERICK A. KEYES, D.M.D., Boston, Mass.,
PAST VISITING DENTIST ST. VINCENT'S ORPHANAGE, BOSTON; VISITING DENTIST MEDFIELD STATE HOSPITAL (INSANE).

(Read at a meeting of the dentists of Quincy, Mass., January 29, 1915.)

THE need of dental work among our public school children is no longer a mere hypothetical question, but a practical necessity. Wherever dental examinations have been conducted by dentists, the statistics gathered have shown that over 95 per cent. of the children's mouths contained defective teeth. These examinations have been held by dentists in Cleveland, Chicago, New York, Cambridge (Mass.), Lowell, Brockton. In Boston, where the examination was made by medical examiners, the percentage is reported as 68 per cent. Conceding the fact that 95 per cent. of the public school children in most cities are in dire need of dental treatment, it is only logical to infer that in the city of Quincy, 95 per cent. of the mouths of the children of elementary school age are in a neglected condition and need dental attention. These statements may appear exaggerated, but we have the facts at hand which will convince any skeptic as to the truth of this statement. We dentists are only too cognizant of the neglected condition of the children's mouths.

Admitting that 95 per cent. of the children in Quincy are in need of dental treatment, the next question to prove is the effect produced by these evil conditions on the physical and mental development of these children.

We all appreciate the important part played by the mouth as an entrance and harbor of disease germs. Some authorities claim that over 80 per cent. of all infectious diseases gain admittance to the body by way of the mouth. Over twenty-seven different disease germs have been isolated from the mouth. What more ideal incubator for germs could one wish than a cavity in a tooth?

THE PROPHYLACTIC VALUE OF ORAL HEALTH AGAINST INFECTIOUS DISEASES IN CHILDREN.

At St. Vincent's Orphanage, Boston, which shelters between 200 to 300 children, dentistry was commenced in November 1910. Previous to this there was a yearly average of over 103 cases of infectious diseases among the children. This was reduced in six months' time to 52 cases. In the last four years we have had the astonishingly low number of six cases of infectious diseases at the asylum, and these were cases of measles. This record was never equaled before at the institution, and I am sure that the dental work was the chief factor in eliminating these infectious diseases.

The following table presents a record of infectious diseases from 1907–08 to January 1915 (the last column being contributed by Dr. Joseph Lyons, the present visiting dentist to the asylum).

Considering these statistics, it is no theoretical conclusion to state that dental work bears a very important relation to the infectious diseases of childhood. The six cases of measles referred to above were all examined dentally, and were found to be those of children who had never received dental treatment. Of the many who were exposed to the infection, not one child who had previously had dental work done contracted

RECORD OF INFECTIOUS DISEASES—ST. VINCENT'S ORPHANAGE, BOSTON.

DISEASES.	1907-08.	1908-09.	1909 to Nov. 1910.	Nov. 1910 to April 1911.	April 1911 to May 1912.	May 1912 to May 1913.	May 1913 to Nov. 1913.	Nov. 1913 to Jan. 1915.
Diphtheria	6	2	1	. .	. .	. .	1	. .
Mumps	8	3	10	4	. .	. .	. .	. .
Scarlet fever	17	8	12	8	. .	. .	. .	. .
Pneumonia	3	5	4	6	. .	. .	. .	. .
Measles	24	50	40	25	. .	. .	6	. .
Tonsillitis	19	16	8	3	. .	. .	. .	. .
Whooping-cough	7	2	2	. .	. .	. .	. .	. .
Chicken-pox	15	17	10	6	. .	. .	. .	. .
Typhoid	. .	. .	. .	. .	. .	. .	. .	. .
Croup	4	. .	. .	. .	. .	. .	. .	
Spinal meningitis	. .	.	. .	. .		. .	. .	. .
Scarlatina	. .	. .	. .	. .	. .	. .	. .	. .
Bright's (acute)	. .	. .	. .	. .	. .	. .	. .	. .
Hemorrhage	. .	. .	. .	.	. .	. .	. .	. .
Tuberculosis of eye		. .	. .	. .	1	. .	. .	. .
Tuberculosis of lungs	. .	. .	. .	. .	1	. .	. .	. .
Totals	103	103	87	52	2	0	7	0

the disease, even though they were not immunized by a previous attack.*

Besides the part played by the mouth and teeth in the etiology of infectious diseases of childhood, there are many other unhealthful conditions among our public school children which can be traced as coming from this source; for example, anemia and rhachitis, due to inability to masticate food, therefore causing faulty metabolism; rheumatism and septicemia, due, in many cases, to the swallowing of pus from an alveolar fistula. In fact, it is possible for all diseases of childhood to have their initial cause in dirty mouths and carious teeth.

EFFECTS OF NEGLECTED TEETH ON THE MENTAL DEVELOPMENT OF CHILDREN.

Our next consideration will be the effect which neglected teeth have upon the mental development of the child. For example, the many school sessions from which a child is absent because of toothache would obviously have a retarding influence upon his progress in school. I had the pleasure, two weeks ago, of hearing Dr. Fones of Bridgeport, Conn., read a paper before the Second District Dental Society of the State of New York, in which he brought forth some salient points showing the effect of missing teeth upon the mentality of children. He stated that "In the brain centers, where the five senses record their impressions, there is a decided interference with a proper functionating of the brain cells, due to these pernicious mouth conditions, not only through the nutritive system, but also from the discordant vibratory impressions playing upon these centers from sore and aching teeth, sharp edges of cavities irritating the tongue, congested and bleeding gums, alveolar abscesses, and temporary teeth pushed out of position by erupting permanent teeth. If impressions on the

* Dr. Harold Hoye, past assistant dentist to St. Vincent's Orphanage. *Boston Medical and Surgical Journal*, January 22, 1914, vol. 170, No. 1, p. 130.

brain are to be properly received, the body must be sound and normal."

Dr. Lawrence Baker of Boston (see DENTAL COSMOS, June 1912, page 663) has shown by experiments upon rabbits that the proper development and expansion of the cranium in early life are dependent in no small degree upon the use of the muscles of mastication.

These muscles cannot exert their tension or pull on the bones of the cranium until the teeth are placed together, and if a child's teeth are badly decayed or sore on one side, so that chewing is done on the opposite side only, the cranium is unequally developed. It will readily be seen that this will influence unequal brain development.

ECONOMIC CONSIDERATIONS.

With these proofs at hand showing the relationship of the mouth to the physical and mental welfare of the children, the next point is one of a purely mercenary aspect. The conducting of children from Quincy to the free clinics in Boston, the Forsyth Dental Infirmary, and the dental colleges would be absurd, inasmuch as the money spent alone on carfares would greatly exceed the money required for the establishment of a local dental clinic. Besides, the time lost in going from the Quincy schools to and from Boston would involve a considerable loss to the educational resources of the city.

By a careful study of conditions in Boston, which I published in the *Boston Medical and Surgical Journal* of November 28, 1912, under the title "School Dentistry," I found that it cost that city $0.03 per hour to educate a child. We may assume that the cost to this city is approximately the same. Therefore it will be seen that for every school session from which the child is absent, the city of Quincy is losing $0.15 per child. There are, I understand, 8000 children in the public schools of Quincy. Acting upon the supposition that each one of these children is absent at least three days in a school year, the city of Quincy is losing $3600.

As I have proved at St. Vincent's, most of these absences due to sickness may be eliminated to a great degree by dental care, and it is purely a business proposition for the city of Quincy to take measures to eradicate this waste of the taxpayers' money. As Horace Fletcher has stated, "The care of the children's teeth is an economical means to an economical end." How shall this end be accomplished? What method would be most productive of results, both from the standpoint of the health of the children and the finances of the city? The first necessity is the appropriation of sufficient money, so that the work may not be retarded by petty obstacles. I have made inquiries of many dental supply houses, and the lowest bid for the complete furnishing of a dental infirmary, including all necessary equipment, was approximately $450. This, of course, is the first expense and will not have to be met again. The upkeep of the infirmary supplies, etc., will probably be $150 per year.

The cities having school dental clinics which are most productive of results report that they compensate a dentist at the rate of $5.00 per morning. This is not in any manner fair compensation to a dentist for a morning's work; in fact, most dentists would be losing money in giving up their practice for three hours for this small amount. It is, however, a professional demand that the city shall recognize dental work on the same basis as it pays other professions for their services. No work is ever well and properly done without some monetary compensation for the time spent. It is true that in a few cities dentists have offered their services gratuitously. At first this plan worked fairly well, but, after the enthusiasm of the moment had waned, few if any of the dentists reported for duty. A dentist is a professional man. He gives hours of his time to charity, and no city should expect his services without some reimbursement, meager though it be, for time spent in the employ of the municipality.

Therefore, in order to establish properly and to run a dental clinic upon this

basis, an appropriation of $2000 the first year and $1500 yearly thereafter will be necessary. To obtain this appropriation should be an easy matter, when the need of a dental clinic and the benefits derived therefrom are explained to the taxpayers of Quincy. It is an investment of money that will pay real interest not only in the health of the future citizens of this city, but in the reduction of the cost of education of the children in the public schools, as I have before stated.

In looking through the reports of the city of Quincy for 1913, I find that more money was spent for automobiles and for the Fourth of July celebration than the amount of the appropriation asked for.

Taking for granted that the appropriation asked for be given, what is the next step to be taken in handling this school dental problem? It is obviously necessary that a dental clinic be established in the city, by the city, for the city. The location of the dental infirmary is very important; it should be preferably in a centrally located school building. An empty schoolroom, coatroom, or any room, even a hallway, where there is sufficient light and running water, are the essential features. At St. Vincent's one of the bathrooms was utilized for this purpose, and was found to make a very satisfactory infirmary.

PUBLICITY.

Publicity is decried by the ethics of our profession, but it is a very necessary means of reaching the parents of the children. This should be done by means of local newspapers, etc. Cards should be distributed to parents after a cursory examination of the children's mouths in the schools, informing them that their children need dental treatment, and asking them if they will have the matter attended to at once by the family dentist. One month is long enough to wait for answers to these cards. All those children whose parents signify their inability to pay a private practitioner his fee for services should be immediately treated. Those who do not answer these cards should be notified again, and if they fail on the second notice to pay any attention, their children also should be treated. In some instances this free treatment will benefit those who do not deserve it, but, without a social service that could investigate each case, this is to be expected.

ROUTINE TREATMENT.

Too much time has been spent in other cities in examination of the school children's mouths by a dentist. Examinations should be made not as a routine method for the compilation of statistics, but in order to pick out cases where the work is most urgently needed. When the work is done it could be tabulated. Tabulating beforehand is a waste of time. Two dentists working in a school should be able to tabulate the conditions fairly accurately in four hours' time.

Those teeth which need immediate extraction should first of all be dealt with. Extraction being finished, the next step is the filling of teeth. This is a long process, but next to extraction is the most important step. If time permits, the teeth should also be cleaned by the dentist, for my experience has been that this acts as a stimulus to the child to keep the teeth clean.

Along with this work, lectures on the care of the teeth could be given in various school halls, and tooth-brushes perchased at a nominal fee and distributed to those children who need them. The cleaning of the teeth by the children themselves twice a day I believe to be more beneficial than the cleaning by the dentist, with the usual post-cleaning neglect. The dentist should concentrate all his time at the beginning upon the major part of the work, extraction and filling.

Suppose the city of Quincy has fifteen dentists willing to spend one morning every third week in this clinical work, I am sure that in one year's time the city would be repaid for any expense incurred in the establishment and upkeep of this dental clinic, and the children of Quincy would improve 100 per cent. in physical and mental efficiency.

THE STRUCTURAL AND OTHER CHANGES ARISING IN CONNECTION WITH METALS USED IN THE MOUTH.

By W. B. HEPBURN, L.D.S., Glasgow.

(Report presented to Section IV, Sixth International Dental Congress, London, 1914.)

IN studying the changes arising in metals used by the profession, the first fact to impress us is that these changes are not constant. For example, a metal as employed as a base for a denture where no teeth are present in the mouth may present an entirely different appearance compared with the same metal when employed as a base for a partial denture, portion of a bridge, etc., where other metals and alloys are present in the same mouth. It will be necessary, therefore, in submitting this report, to distinguish in each instance how the metal or alloy behaves in an edentulous mouth; its effects upon the tissues in relation to it, and also its behavior when in close relation to other metals or alloys.

Generally speaking the metals employed by the profession are present in the mouth in the pure form, by which I mean that even when present as constituents of alloys they are the purest obtainable; for example, a piece of 18-k. gold will be composed of pure gold, pure copper, and pure silver. By assuming this to be true—and I have it on the authority of several of our sources of supply that it is true—we are enabled to exclude from the scope of this report the probable effects of many metals and metallic salts which would be capable of making their presence both seen and felt if present as impurities.

GOLD.

Taken all over, I think that at present gold is the metal most extensively used by the profession, so that I will consider it first in order. Gold in the pure form of 24-k., or 1000 fineness, is met with as fillings, as thin linings on vulcanite dentures, on the outer shell of crowns and collars, and certain abutments for bridges, inlays, etc. As a lining for vulcanite dentures it retains its color in edentulous mouths where the saliva is normal. The mucous membranes are benefited by its presence, and in instances where vulcanite itself fails to give comfort, from sponginess of the tissues, or where there exists a distinct tendency toward irritation, followed by ulceration, pure gold linings in the majority of cases afford a reliable means of relieving the condition. In excessively alkaline salivas the metal is discolored, and can only be kept bright by daily polishing. Where biliary symptoms are present the darkening of the metal closely resembles the formation of a sulfid, but in no condition of the saliva is there loss of metal by solution or other means, or formation of any salt of gold leading to loss of metal.

Where other metals are present, such as amalgam fillings, the changes are influenced in a fairly definite ratio by the presence of copper, zinc, and mercury. For example, a partial vulcanite denture, gold lined, and in contact with a tooth filled with Sullivan—or copper—amalgam, is discolored at that point, the discoloration closely resembling a dark copper oxid. If the same denture be in contact with amalgam containing, say, silver, tin, copper, and zinc, the discoloration is less dark but tinged with gray. In a mouth where no amalgams are present, the same denture re-

mains under the same condition as in the edentulous mouth—namely, it is influenced by the saliva only.

Dentures of 18-k. gold in edentulous cases follow very much the same rules as the linings of pure gold, and also where amalgam fillings are present the darkening is present, and where they are absent the color is better. A denture made from 18-k. flat gold, and swaged, remains a better color than one made from the same karat of gold and cast—and this happens under all conditions. Also, a denture cast and properly annealed and gently hammered all over on a Babbitt metal die, darkens less on the hammered surface than on the cast surface. The only explanation I dare put forward is that the rolled metal has its molecular structure changed in such a manner that the preponderance of gold in each mixed crystal is capable of protecting the silver and copper to a greater extent than in the irregular crystal of the cast metal.

So far as my observations have gone the presence of platinum in gold for dentures and clasps, while increasing the elasticity of the alloy, does not lessen the oxidation of the surface. One or two forms of 17-k. platinized band gold were more affected than 18-k. ordinary band gold. Very much the same effect may be observed in the platinized foils sometimes employed for surfacing gold fillings. There is more darkening of the approximal surface than in the filling made from 1000-fine gold. The mat consisting of gold, plus platinum, etc., as employed for fillings, exhibits this darkening even more than gold and platinum foils.

I will defer the consideration of fillings, crowns, etc., until the metals used as bases, etc., have been considered.

Platinum and its alloy, iridio-platinum, are so seldom found exposed to the saliva that it is hard to obtain sufficient data to draw conclusions, but one may be considered safe in assuming that they will darken less than pure gold, even when in exposed positions, and be less affected by amalgam fillings yielding mercury.

SILVER AND PLATINUM ALLOY.

The alloy of silver and platinum known in Britain as dental alloy, containing anything from 10 per cent. to 35 per cent. platinum, and the balance silver, seems to be falling into disuse, chiefly on account of its enhanced cost, a cost which is not in proportion to its worth as compared with the 16-k. and 18-k. gold for the same purposes. This alloy was employed for the same purposes as flat gold plate of 18-k., and is of a grayish-white color when freshly polished. In edentulous mouths its use was restricted to upper base-plates, as the alloys containing the higher percentage of platinum were harder to swage without fracturing than gold. In many mouths it disclosed a marked darkening on the lingual surface of the palatal base, even in cases where the saliva was neutral and slightly acid. Many cases were less affected on the surface next the palate, pointing almost to the conclusion that foodstuffs and liquids acted more rapidly upon the alloy than the normal saliva of the patient. The tissues remained normal.

Frequently gold and platinized gold bands were soldered to the alloy when employed for partial dentures, the solder generally being 12-k. to 15-k. gold solder. I have found more trouble from galvanic action in mouths where this alloy was employed than any other as a base metal. A glance, meanwhile, at the combination of metals in such a case will be sufficient to indicate this. In the dental alloy, silver and platinum; in the band metal, gold, silver, copper, and sometimes platinum; and in the solder, gold, silver, copper, and a trace of zinc. Place these in the same mouth as a copper amalgam filling, and not necessarily in contact, and the symptoms are at times quite exhilarating.

Dental alloy is not constant in regard to its physical properties. One great difficulty is the tendency toward brittleness, especially in dentures to be repaired; and the solvent action upon the lower grade alloys of a pickling solution suitable for 16-k. gold. Examination of

several samples of this alloy have satisfied me that where less than 30 per cent. platinum is present these defects are more marked, and oxidation is increased. The dissemination of the platinum through the silver is not constant, and frequent and careful annealing during swaging fails at times to prevent fracture.

ALUMINUM AND ITS ALLOYS.

Pure aluminum rolled in sheet and swaged—care being taken to employ a Babbitt metal die and a tin counter-die—behaves in a more constant manner than when cast. In edentulous mouths with normal saliva cases have been examined after five years and found giving good results both as to the metal's effect upon the mucous membrane and the appearance of the metal itself, which remains clean and free from darkening even in deep palates and rugæ. Where the saliva is distinctly alkaline, its behavior varies. One cast upper denture examined was exceedingly rough and pitted upon the portion of the palate posterior to the suction disk. This was certified as wastage of the metal since its insertion, when compared with the rest of the plate—and that within two years of its insertion. Another base-plate struck from flat sheet became perforated in the same region within thirty months of insertion. The cast denture was in an edentulous mouth, and the struck plate in one with lower teeth in position but no fillings present. A denture lately came under my observation prepared of cast aluminum and silver. There were several amalgam fillings in position in some lower teeth. The saliva was acid to litmus paper, and this denture, close upon two years old, was dark and offensive. The patient, an intelligent Canadian, stated that he left the plate intentionally unscrubbed, as he had a peculiar steely taste in his mouth for some time after polishing the surface of the metal. I made tests for galvanic action between fillings and the plate with the ammeter of an ionic outfit, but beyond a very slight waver of the needle, and the consciousness on the part of the patient of the steely taste, there were no definite results to be obtained. I certainly expected he would have experienced shock, especially in a large contour molar filling, but the pulp may have been guarded by cement, or possibly it may have been dead. All the fillings, except one recently inserted, showed changes in condition.

From my observation of aluminum and its alloys, and keeping in view the fact that the metal exerts its electro-positive properties even when alloyed, I am of opinion that the choice of mouths suitable for these is extremely limited, and even in the most suitable cases the metal and its alloys should be gilded from time to time.

Aluminum bronze 5 per cent. I have had to discard, as it was open to the same objection as the aluminum alloys, even when employed for temporary purposes in mouths where copper amalgam and silver-tin amalgam were in position. The bronze oxidized badly, and galvanic action was intensified.

Victoria metal, the alloy of a golden yellow color, and containing nickel, copper, and zinc, became perforated in one instance in less than one year from date of its insertion. The fillings present were cements and amalgams, and there was a considerable wastage in all. The saliva was slightly acid. From my experience in several such instances I have ceased using these alloys as base-plate metals, as I have so far been unable to establish a regular set of conditions where one may say definitely that good results will accrue. From the metallurgist's point of view, aluminum, zinc, antimony, and magnesium are base metals capable of exerting their influence even when alloyed. If this is accepted, then I am of opinion that these metals should be eliminated from the mouth, or employed as constituents of alloys for temporary purposes only.

If we consider mouths where partial dentures and several varieties of fillings are present, the results obtained are at times so perplexing that it becomes extremely difficult to draw an accurate in-

ference from what is presented. For example, why should there be present intense galvanic action between dissimilar metals in one mouth, accompanied by erosion, recession of the gum, and unsatisfactory results generally from work done in the mouth, in some cases, and comfort and good results under almost similar conditions in others?

Why should a gold crown articulating with an amalgam filling be accompanied in one case by galvanic action and frequently pulp trouble, and in others quiescence?

Why should a partial 18-k. gold or dental alloy denture become tarnished in an otherwise clean mouth, and in another less well cared-for mouth remain quite clear and bright?

These are a few of the questions which I have put to myself, and have had put to me, and they are difficult to explain. In the list of instructions submitted to reporters to this congress we are advised not to employ theories, but to keep to hard and cold facts, by presenting the subject as it is. By taking advantage of this last part of the instructions I shall be saved from the necessity of explaining my own queries; and by presenting to you what I have learned and observed, you will necessarily be left to draw your own conclusions.

I think it will be admitted that our greatest difficulties are presented in mouths where there are several metals in position, as in edentulous mouths the conditions are much more constant and more readily understood.

FILLINGS.

As a rule the complexity is produced by the presence of different kinds of fillings, each filling having been selected as the most suitable or convenient for the cavity as it occurs. When a filling is inserted we are generally presupposing that our work will be permanent, at least as far as the individual cavity concerns us—excepting those cases, of course, where the caries has extended so far only as to lead us to hope for a moderate continuation of usefulness of the tooth previous to crowning.

Taking amalgams, there are certain general changes which occur after the filling has been in position for some time which cannot be explained as entirely due to expansion, contraction, or spheroiding. For example, cases occur where an amalgam filling under observation at regular periods suddenly discloses changes in its relationship to the cavity walls which cause it to be condemned. Industrially, alloys are employed which remain constant in their behavior as regards their physical properties—are exposed to thermal changes, friction, strain, and the test of time, and do not exhibit the inconstancy I refer to. The alloys which we employ as amalgams contain metals which, if we except zinc, are insoluble in human saliva, and are confined, if we except copper amalgam, to silver, tin, and mercury, with copper, zinc, gold, and platinum added as modifying metals. Examination of these metals, taken singly in the pure state or in alloys—with the exception of zinc —and immersed in normal human saliva, shows that no change of volume occurs. An examination, on the other hand, of many amalgam fillings which have been in position and given service for several years, it may be, exhibit well-defined changes—such as expansion or contraction, spheroiding and roughening, or a condition resembling erosion in its character. All these changes have been observed for years, and we are still attempting to solve the riddle.

I wish it to be clearly understood at this stage that I am confining my remarks to those mouths where we have consistently been able to do our best work, and where the patient has kept the teeth regularly brushed and the mouth free from septic roots. By doing this we will avoid the question of bad cavity preparation and its attendant evils and lack of cleanliness on the part of the patient. A badly prepared cavity in a dirty or a clean mouth brings its own retribution within two years of insertion. Everyone is more or less familiar with the mouth in which gold fillings never remain a good color, being generally brownish in appearance, and

this intensified in approximal spaces. A brisk buffing with precipitated chalk quickly removes this, and the surface of the metal *may* be smooth and regular. Personally, I had always explained this to myself as due to fruit stains, excess of sulfureted hydrogen, or in some cases to faulty use of the brush, etc.

For some time past I have taken notes from my close examination of such cases, and my results are as follows:

(1) The darkening of the fillings is present in mouths both alkaline and acid to litmus paper.

(2) In mouths, too, being carefully attended to by the patient, the difference being that the darkening was generally confined to positions not readily accessible to the brush.

(3) Is never present in mouths where gold is the only metal employed for fillings or crowns.

(4) Is present where copper amalgam filling has been used to restore lost tooth tissue to any extent.

(5) Is present where German silver is present as part of apparatus for treatment of malocclusions, even when no amalgam fillings are present.

Then, again, my notes on the examination of amalgam fillings give me the following results:

(1) In young patients, when copper amalgam alone is employed, the amalgam fulfils its function admirably, does not wash out, expands or contracts little, and recurrent decay in cavities, underlined with cement, is absent.

(2) Where copper amalgam is employed for the molar region and gold for the incisors, washing out of the amalgam is present, and there are frequent failures of the gold in cervical regions, with darkening.

(3) Where amalgam and not necessarily copper is employed in anything like close proximity to gold fillings, both fillings are defective.

(4) Where inlays of 20- and 22-k. gold are similarly placed, the results are better.

(5) Where inlays of silver-tin-copper or gold are in contact with gold fillings, crowns, or inlays, no change is apparent.

(6) In cases where I have only employed a so-called gold amalgam in the molar region, and gold in front, the destruction is very much reduced.

(7) Where dentures of aluminum, aluminum-bronze, or Victoria metal, are present, all fillings suffer.

In compiling these results I have purposely avoided those cases of rapid destruction following upon a gold filling or crown articulating with or actually in contact with an amalgam filling, as I think I am justified in saying that where such practice can be avoided it is better. Mercury will draw to gold even from an old amalgam filling, with mutual harm to gold and to amalgam. Cases do present themselves where gold has been built upon an amalgam foundation with success, but in such cases the amalgam has been mixed with little or no excess of mercury, and is allowed to set before adding the gold. What little mercury attacks the gold is confined to the layers directly in contact with the amalgam, and shows in successful cases no signs of spreading through the filling.

If we admit the general correctness of these two groups of results, I think we may safely make one or two general conclusions, and the first is that we should avoid complexity as far as possible in inserting metals in the mouth. By carefully scanning the work already done in a given mouth, and considering in what relation the new work we are about to do will stand to it, we are enabled in many instances to avoid complexity, and at the same time to improve our results. For the past seven years I have been adopting this rule, and by charting up the class of filling inserted in each instance I can observe their behavior. If amalgams are indicated I make the restoration with the same amalgam, and never do I employ copper amalgams to any extent in a patient over fourteen years with a clean mouth. When large restorations are necessary, hollow inlays of gold, or silver 73 parts, tin 23 parts, gold 2 parts, and

copper 2 parts, yield better results than copper amalgam in mass.

Looking to the cause of many of our failures I am of opinion that as a profession we will have to remold our ideas to a great extent as to our filling operations. Amalgams yielding perfect theoretical results and perfect as to laboratory tests for expansion, contraction, edge strength, etc., very frequently fail when tested in the mouth; while many alloys prepared for amalgams theoretically wrong—being very little short of mechanical mixtures of the several metals with mercury as the cementing agent—have given good results, and that over a long period of years. Whereas, on the other hand I have still to find a case where the true silver-tin alloy gives permanent results, while alloys with the addition of copper or gold, or copper and gold, are giving good results.

The determination of the cause of the apparent wastage or "solution" of metal fillings in the mouth is far from being definitely answered.

In alloys as used industrially, as in engineering, for instance, we never find two groups of alloys, or any combination of single metals brought together into working parts which would react the one upon the other, or in other words which would behave as electro-positive and electro-negative one to the other, as failure to guard against this would mean wastage of the metals in contact. Applied to our work, I am of opinion that bringing such metals as zinc and copper together in the mouth is inadvisable. Zinc is added to certain proprietary alloys to hasten the setting and increase the whiteness: copper to increase edge strength and reduce oxidation. If the effects of these two metals were confined to the amalgam or alloy containing them, we would reckon on the proportion of each required to produce a desired result, but from the result of many tests it is known that each metal contained in an alloy or amalgam, unless when in perfect solution with another metal or metals, continues to exert its influence on the physical properties of that alloy or amalgam for an indefinite period, over and above which it still retains its power of influence as an electro-positive or electro-negative.

I am also of opinion that it is the power possessed by the separate metals to exert their electric properties that accounts for much that is mysterious. I had hoped to present a series of scales of results made by testing for galvanic action between metals in the mouth. The ameter I possess, I discovered too late, required fully one-half miliampère to move the needle, and the average shock experienced as between fillings, when pronounced, only caused the needle to waver. I intend carrying out some tests with a galvanometer of the mirror type with some definite scale indexed on the glass to go by, and hope to have the pleasure of presenting these results to the profession.

The darkening on gold fillings, crowns, dentures, etc., consists mainly of metallic copper, while the corrosion of retaining bands, clasps, etc., made of German silver, point in both instances to a depletion of metallic copper, with zinc exaggerating the action in the case of German silver.

The silver-tin amalgams, while behaving much better than copper amalgam, become very irregular on the surface after a few years, and have every appearance of diminution in bulk by the loss of some constituent metal, and can readily be cut with a dentin bur. The cause of this is hard to find, unless we can trace the destruction as coming from other fillings present in the mouth, free mercury, or free tin becoming oxidized and being washed out by the saliva. Inlays made from the same formula as the silver-tin amalgam give good results, while the addition of a trace of copper and gold, while theoretically unsound, gives still better results.

The patient's habits certainly influence our work, as, for instance, the difference between a clean, well-kept mouth and a dirty one which seldom if ever receives the attention of a brush; the manner of feeding, whether the food is

taken soft and swallowed without the necessity of mastication, or where the food is taken as dry as possible and receives efficient mastication. In the mouths of the hard chewers almost any class of filling material will serve well, provided that it possesses sufficient edge strength, whereas in the majority of soft feeders almost any class of work requires careful and constant supervision. The so-called iron tonics, I consider, affect our work in many instances in a manner we seldom imagine. I have in mind an instance of where a group of silicate fillings, underlined with an oxyphosphate of zinc cement, remained a beautiful color and wore almost as advertised until the patient went through a course of iron tonics; these fillings were ruined in color and washed out rapidly. Amalgams suffer after a prolonged course of such tonics, but less so than cements and silicates, while gold fillings, apart from a surface darkening which disappears when brushed, show no change in volume.

Metal dentures are affected in very much the same manner as fillings, and the same acids will attack the metal or alloy in the mouth as attack it in laboratory tests.

One always has to allow so much for the personal equation of patient and operator that anything approaching dogmatism on any one point is impossible. Even where an operator can seriously examine his results extending over several years, and in mouths which he has regularly under inspection, such results, while affording him valuable assistance, would not justify him in becoming positive or dogmatic as to like results following another operator.

In what I have stated in this report I have attempted to bring before you the results of my observations of normal cases. There are many cases which are presented where some metal or alloy has come far short of expectations, and where the probable cause is so obscure as to place it in the realm of theories. Such cases I have purposely avoided, as in our reports we should endeavor to find some common ground of agreement and discuss the question to our mutual benefit.

TWO UNUSUAL CASES INVOLVING PREMOLARS.

By ROBERT H. IVY, M.D., D.D.S., Philadelphia, Pa.,
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I. Supplemental Right and Left Mandibular Premolars, One Impacted.

SUPPLEMENTAL teeth, *i.e.* extra teeth in the arch which are well developed and resemble those of the normal dentition in the region in which they are found, are probably more common than the number of reported cases would indicate. They are not so frequently met with, however, as supernumerary underdeveloped teeth. Supplemental teeth are generally found in the second incisor and the premolar regions. Search of the literature reveals very few recorded cases of supplemental premolars, Gabell and Whitehouse according them some consideration in "The Science and Practice of Dental Surgery," chap. iii, p. 40. The following case, referred to me by Dr. Robert D. Hand, is a unique example of this anomaly in that it occurred on each side of the mandible, one of the supplemental premolars being impacted.

The patient, a woman of about twenty-five years, had for four years noticed a

small lump on the inner side of the gum between the two mandibular premolars on the left side, well down toward the floor of the mouth. This caused no inconvenience until about six months before consultation. At this time the patient began to have pain and increased swelling in the region mentioned. Several times the surface would break, with a discharge of pus within the mouth.

Fig. 1.

(Case I.) Cast of lower arch, showing erupted supplemental premolar on right side, and position of unerupted premolar on left side.

This was associated with swelling and tenderness of the submaxillary lymph nodes and difficulty in swallowing. Examination of the erupted teeth showed no evident abnormality or disease sufficient to account for the inflammatory symptoms. On the right side of the lower arch were three premolars, the middle one evidently being supplementary, as the patient said it did not erupt until long after the other two, when it pushed up between them. This tooth was situated slightly to the lingual side of the arch, but was quite as well developed in every respect as the other premolars. The first molar on the right side was missing, having been extracted several years before, the space being filled by forward growth of the second and third molars. There was no evidence of supplementary teeth in the upper arch. The presence of the extra premolar on the right side led to the diagnosis of a similar condition on the left, later confirmed by the X-ray, which showed a well-developed, unerupted supplementary tooth lying between the premolars. It is probable that, had the first molar on the left side been lost early in life, the extra premolar on this side also would have had room to erupt and take its place in the arch.

Fig. 2.

(Case I.) Roentgenogram showing three erupted premolars on right side of mandible. (Picture made by Dr. H. K. Pancoast.)

Treatment. Under ether anesthesia, an incision was made over the swelling on the lingual side, the bone overlying the crown cut away, and the supplemental tooth removed with elevators without great difficulty, and without injury to the other teeth. The wound healed in a few weeks without complications. Examination of the tooth after removal showed some abnormality in the formation of the crown, which, however, did not prevent its classification as a premolar. The unerupted tooth on the left side and the supplemental tooth on the right side are shown in the accompanying illustrations.

There is considerable speculation as to the significance of these supplemental teeth. It is quite likely that their occurrence is to be explained on evolutionary grounds as a reversion to the dentition possessed by some of the progenitors of man who had more than two premolars; in other words, the supplemental teeth are probably examples of atavism.

Fig. 3.

(Case I.) Roentgenogram showing impacted supplemental premolar on left side of mandible. (Picture made by Dr. H. K. Pancoast.)

Fig. 4.

(Case II.) Roentgenogram showing impacted second premolar lying in line of fracture of mandible. (Picture made by Dr. H. K. Pancoast.)

II. Fracture of Mandible Complicated by Impacted Second Premolar.

This patient, a man of twenty-nine years, came to the surgical out-patient department of the University Hospital on April 7, 1915, and was referred to me by Dr. G. M. Laws. He consulted the hospital on account of a hard, painful swelling of the left side of the lower jaw in the premolar region, which had first appeared six weeks before as the result of a blow. The patient had taken no treatment except home remedies. Examination of the mouth showed the left mandibular first molar and second premolar to be missing. The first premolar was slightly loose, and manipulation revealed a fracture of the mandible immediately behind this tooth, with fibrous union. The tissues of the region were considerably thickened and tender. The patient could move the mandible without difficulty, and the lower teeth came into good occlusion with the upper. Examination with the X-rays showed a complete fracture just behind the lower left first premolar, and an unerupted second premolar lying in the line of fracture, with its crown impacted against the root of the first premolar. The picture also indicated localized osteomyelitis in the region of the fracture.

Under novocain-adrenalin conduction anesthesia of the left mandibular nerve at the mandibular foramen, the impacted tooth was removed with an elevator, together with a small sequestrum of necrosed bone. A fixation appliance for the fracture was not considered necessary, as there was already partial union in good position.

METALLOGRAPHY.

By B. R. BAKKER, Utrecht, Holland,
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Translated by HERMAN VAN HASSELT, D.D.S., Philadelphia, Pa.

(Read before the Netherlands Dental Association, October 1914.)

THE Netherlands government has thought it necessary to add to the dental curriculum a certain amount of instruction regarding the metals. To this subject one could also add the study of the properties of other materials which are used daily in dentistry; the term "materia technica," according to the interpretation of the teachers of the Dental Institute, comprises a knowledge of all those dental materials which do not belong in the category of materia medica. In this class belong all kinds of cements and amalgams. This subject will therefore cover such a large field that more than ever a systematic division of the work seems advisable. For the last ten years the term "metallography" has come to comprise the entire teaching of the metals and their alloys in the light of physical chemistry. Analytic chemistry, so far as it pertains to metals, and the knowledge of the processes by which the metals are obtained from their ores, form the subject of metallurgy proper. In my opinion it is of greater importance that prospective dentists be taught the properties of metals and their alloys, and understand the causes of these properties, than that they know the processes of metallurgy in the sense mentioned. In practice we have very little to do with the pure metals. Only in a few instances is it of use to know their technical, less important properties. Nearly always is it necessary to add to a metal more or less of one or more other metals to make the material useful; nearly always, therefore, we have to work with alloys. From a physico-chemical viewpoint these are very particular mixtures; therefore in the teaching of metallography it is of importance to have the students understand thoroughly the character of these alloys, upon which the success of their work largely depends.

During the last few years the knowledge of the alloys, as a physico-chemical system, has advanced rapidly, since Guthrie demonstrated the analogy between watery solutions and molten alloys. Mention should also be made of the advancement of the doctrine of heterogeneous balances by Bakhuis Roozeboom, whose work has been of great influence in metallography. Although we are not here to discuss theory, a few theoretical remarks cannot be omitted.

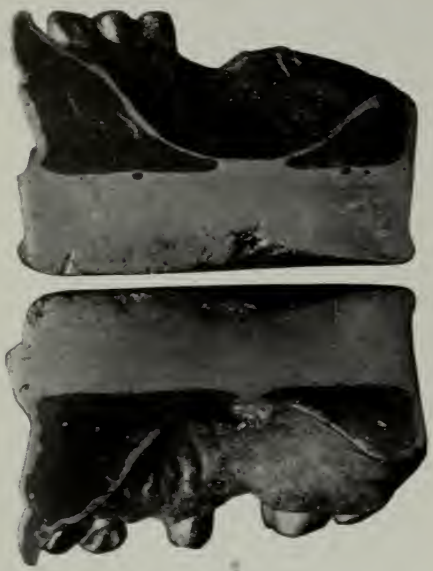
PHENOMENA OBSERVED IN MELTING METALS TOGETHER.

What happens when two metals are melted together?

In the first place, they can remain separated, like oil and water. This happens, or nearly so, for instance, with lead and zinc, as long as we do not increase the heat above 920°C. An ingot made from this molten mass will appear as shown in Fig. 1. Excluding these cases, we shall deal only with components which in a fluid state form a *complete solution*. With this restriction we ask, How will these components relatively act in a condition of crystallization? The answer must be as follows:

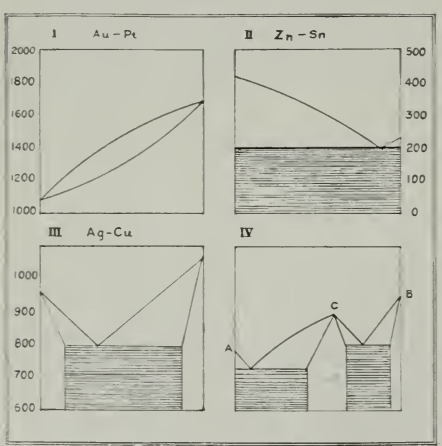
The components—(1) Remain in solution. (2) Form a mechanical mixture. (3) Form a chemical union.

Fig. 1.



These answers may be more clearly understood when we formulate the ques-

Fig. 2.

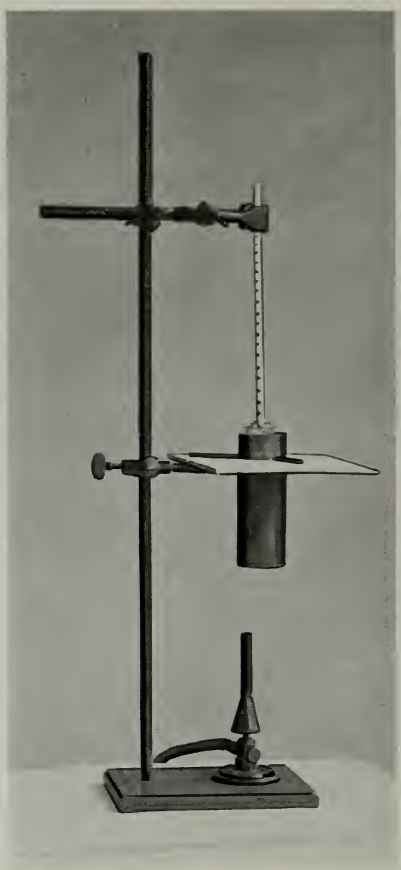


C. T. (concentration-temperature) diagram.

tion thus: At the point of crystallization, how will the molecules of each of the components behave toward those of its own kind and toward those of the other components? And the answer will be as follows:

(1) The molecules of component A remain in the same position which they occupied in the molten mass relative to the molecules of component B. The

Fig. 3.



crystallized alloy thus is homogeneous in the same manner as the molten alloy. The proportion of the amount of A to the amount of B molecules is in all *mixed crystals* the same as the proportion of the components of the alloy. The metals form a *solidified solution*.*

* A solidified solution, therefore, is a special case of crystallized solutions.

(2) The molecules separate, and those of the same kind unite. Crystals form which are either all of A molecules or all of B molecules, and these crystals, or groups of crystals together, form a *mechanical mixture.*

(3) The molecules (or atoms*) form a *chemical union* with the molecules (atoms) of the other component.

Besides the components A and B, we have to deal in certain concentrated solutions with a third substance, or C.

In this subdivision, intervening forms may appear.

For instance, the molecules of one component may first be saturated, as it were, with the molecules of another component, or *vice versa,* when the yet liquid balance of the alloy naturally will change its constituency, and will at last fall apart into a mechanical mixture of a saturated A B solution and a saturated B A solution. A series of A B alloys then forms an *unbroken succession of mixed crystals of the same kind.*

There is a close connection between the structure in the different forms obtained and the temperatures at the various stages in the process of crystallization.

METHOD OF OBTAINING DIAGRAMS.

This is graphically presented for each of the three series by a so-called concentration-temperature diagram, or shortly, a C. T. diagram. (See Fig. 2.)

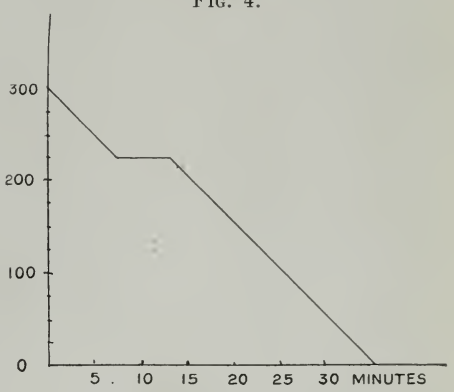
In Fig. 2, the fields of the diagram for the mechanical mixtures are designated by shaded lines: I is the C. T. diagram for an uninterrupted succession of mixed crystals of the same kind (Au-Pt); II represents the ingot of an alloy which forms a mechanical mixture (Zn-Sn); III represents an interrupted succession of mixed crystals of the same kind (Ag-Cu); while in IV a case is shown in which the components at a definite concentration form a chemical union.

Before going into details of these diagrams, we have to consider the method of obtaining the data for such a figure.

The data necessary for drawing the *lines* of a C. T. diagram are points. We have to decide the situation of a sufficient number of points in relation to a definite axis system. For binary alloys we choose as axes the x and the y axis at right angles to each other, and on the ordinate we mark off the temperature in centigrade, on the abscissa the percentage of concentration to substance B.

Now if we draw vertical lines on the abscissa from the points marked 10, 20, 30, up to 100 % B, then each of these

FIG. 4.



lines will help to indicate one of the desired points. Such a point will always be found, when we have determined the fusing-point of the alloy whose concentration has been indicated by the vertical line. This fusing-point we measure off on the ordinate and then draw through this a line parallel to the abscissa. The point of intersection between the vertical and the horizontal lines then will be one of the desired points.

To determine the fusing-point is a relatively simple matter, especially when this does not exceed 500°C. For this purpose an apparatus as shown in Fig. 3 and a watch with a seconds dial are used. The metal or the alloy is melted in a glass tube, which is placed in a sand bath. When everything is sufficiently liquid, the thermometer, which

*Atoms—because most probably most metal molecules consist of one atom.

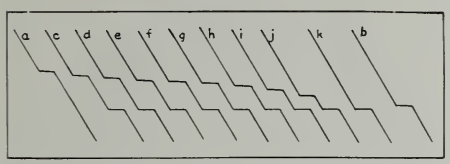
is provided with a safety tube, and which has previously been warmed, is placed in the mixture. We then wait for the moment when the thermometer record begins to descend, when we notice the temperature at each minute or half-minute successively. The series of temperatures obtained is marked off on the vertical axis (see Fig. 4), and the time on the horizontal axis. The intersection of these co-ordinates gives us a succession of points, which in the case of "10" will give us the lines shown, from which the fusing-point, in this case 226°C., may be read off immediately. (For metals with a higher fusing-point the same method may be followed, only the instruments used are different. It is advisable for temperatures from 500° to 1200°C., to use an electric oven, such as shown in Fig. 5. The temperature is easily regulated in different weather conditions, and is read off from a 1000-volt meter which has been connected with a thermo-element.)

FIG. 5.

For a series of Zn-Sn, of which the concentrations increase by 10%, we get in this way the lines a c d, etc., in Fig. 6. Where in these lines we find two horizontal sections, the number above indicates the temperature at which the alloy commences to crystallize; the

one below, where crystallization has been completed. Further we note that in this series there are three melting lines, a k b,

Fig. 6.



with one horizontal section, *i.e.* those of the pure components and one of an alloy. Besides, we observe that the horizontal sections below are all situated at one height, *i.e.* at 200°C. The data from these lines we unite in the way mentioned above into one diagram (see Fig. 7), which corresponds to II in Fig. 2.

(5) The other alloys melt (or crystallize) within a temperature interval.

(6) In the crystallized alloy are Zn and Sn crystals next to each other. (Mechanical mixture Zn-Sn.)

That alloy of the entire series which has the lowest fusing-point is called the "eutectic alloy" or the "eutecticon," and

Fig. 7.

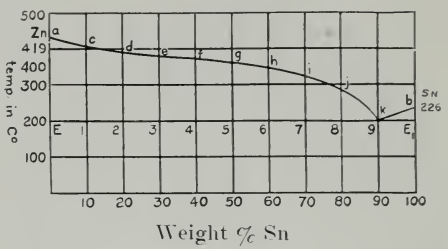
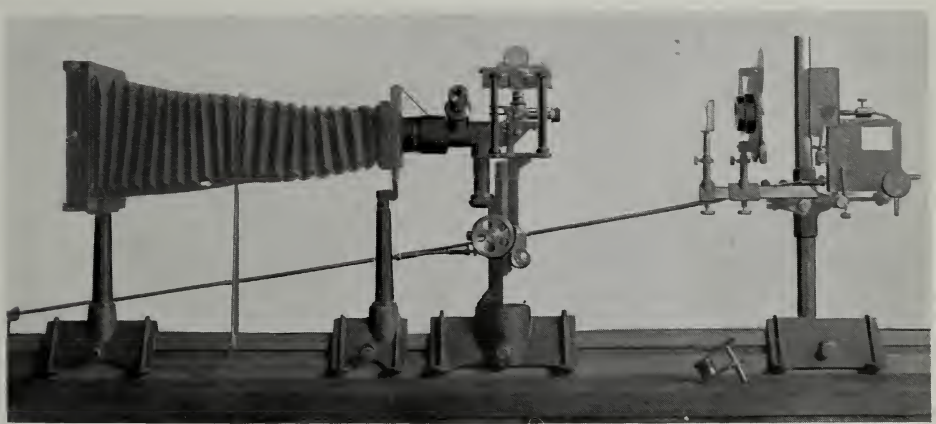


Fig. 8.



From this diagram we read the following:

(1) The fusing-points of all the Zn-Sn alloys.

(2) Zn and Sn will lower each other's fusing-point.

(3) An alloy of 94% Sn and 6% Zn has the lowest fusing-point.

(4) The pure components crystallize (or melt) at a definite temperature; this happens also with the alloy mentioned under (3).

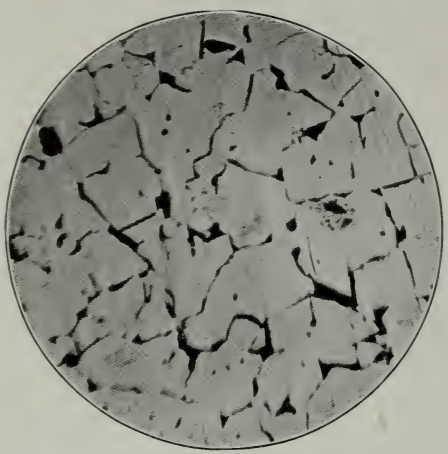
the temperature at which it crystallizes is the eutectic temperature.

MICROSCOPIC OBSERVATION OF THE STRUCTURE OF ALLOYS.

Let us now return for a moment to the structure of the alloy. The data of the thermic analysis are not always sufficient to construct with surety a diagram in all its details. Microscopic research is resorted to in such cases.

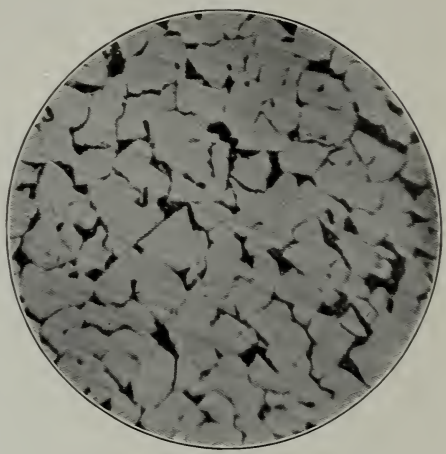
This is always done with direct light; it is impossible to grind metals so thin that one could work with transmitted light. To make a preparation, a perfectly horizontal spot on the piece of metal to be examined is first ground down. This spot then is polished until, if possible, all scratches, even microscopic ones, have disappeared, and then generally the spot is etched by means of a suitable liquid. Crystals of different constituency will be affected by the etching liquid in different degrees, consequently the light will not be reflected evenly. With a specially constructed metal-microscope (see Fig. 8) it is possible for us to obtain a differentiated image.

Fig. 9.



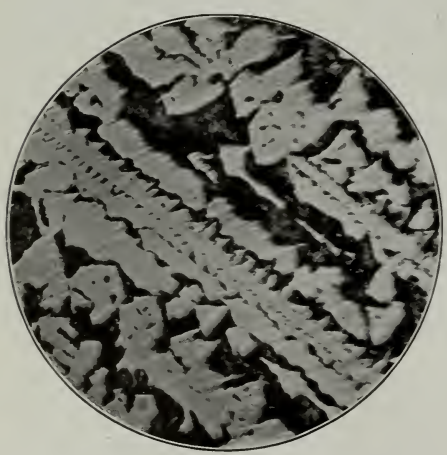
Sb 90, Pb 10, cooled quickly. (× 80.)

Fig. 10.



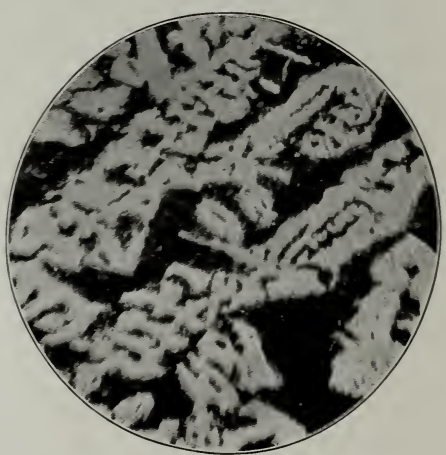
Sb 80, Pb 20.

Fig. 11.



Sb 50, Pb 50.

Fig. 12.

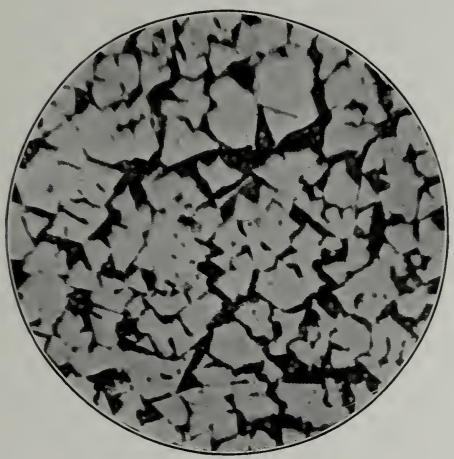


Sb 40, Pb 60.

The source of light is a small arc light. By a system of mirrors and prisms, the rays can be thrown against

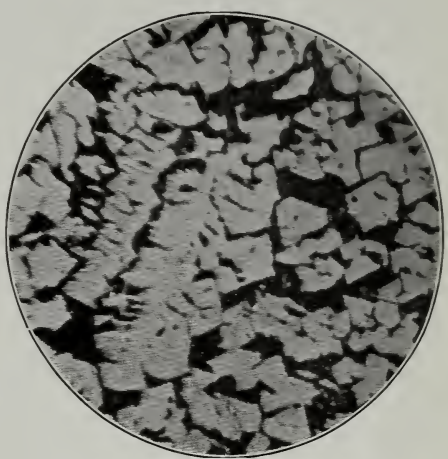
In order to obtain the C. T. image, electricity and volume measurements will be of further use.

Fig. 13.



Sb 70, Pb 30.

Fig. 14.



Sb 60, Pb 40.

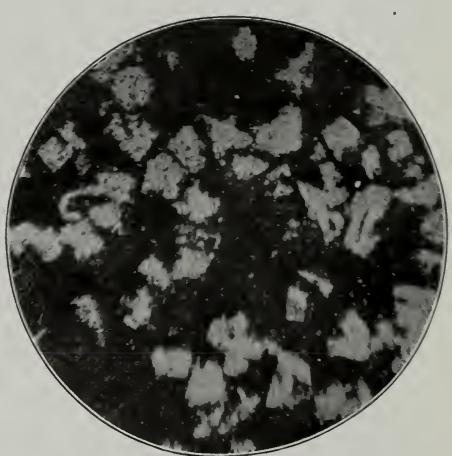
the object through the objective, which will give sufficient light for ocular observation from the side of the instru-

If we take for granted that we are able to construct the C. T. diagrams of different alloys, which indeed has been

Fig. 15.

Sb 30, Pb 70.

Fig. 16.



Sb 20, Pb 80.

ment, as shown, just as for photographic uses. (See series of photomicrographs of Sb-Pb—Figs. 9–16—taken by Miss N. Mieremet, laboratory assistant.)

accomplished with a great many combinations, then the question arises, What is all this for?

First this graphic method has advan-

tages in itself; that is, we obtain with ease a number of data. When, for instance, the fusing-points of gold-copper alloys are desired, a very simple line will give us full information. (See Figs. 17 and 18.) Such a figure fixes itself in the memory much better than does a series of numbers. The greatest advantage of a diagram, however, lies in the fact that it enables us to see at a glance the crystalline structure of an entire series of alloys—and on this structure depend largely the mechanical and technical properties of the alloys.

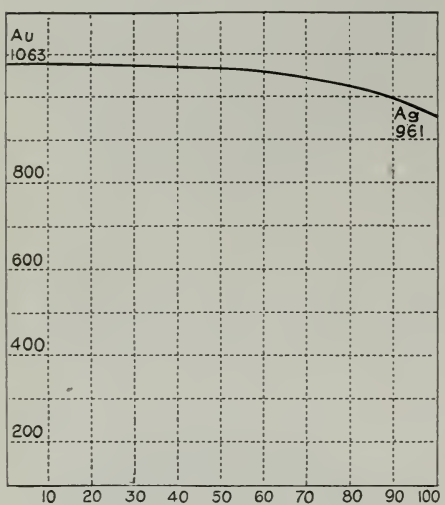
The nature of this dependence has been shown, so far as concerns density, by the Russian Kurnakow (see Fig. 19). It appears in the simplest form in mechanical mixtures. The density is increased in direct proportion to the proportion of the components. This relationship is represented by a straight line. In an uninterrupted succession of mixed crystals we find even in weak concentrations the density number increasing rapidly. Somewhere in the series a maximum is reached, which can always be found in a line drawn concavely downward. An alloy of two metals which remain in solution when in the solid state, therefore, is always considerably higher in temperature than either of its components. We also cannot expect, as elsewhere, surprises in the sense of any considerable differences in density appearing simultaneously with smaller changes in the percentage of the components.

We find such effects in the third case, but in this instance we have a chemical union. We cannot say much of the properties of this new substance. This is, however, always represented by a maximum in the H [density] diagram. (See Fig. 19, II and III.)

We must take into consideration that this figure is only given as a diagram. The real H values are, of course, different for each alloy. With the appearance of the new combination, the density number increases in most cases of known combinations so rapidly that the alloy in which the combination appears loses its value to a considerable degree, owing to its great brittleness.

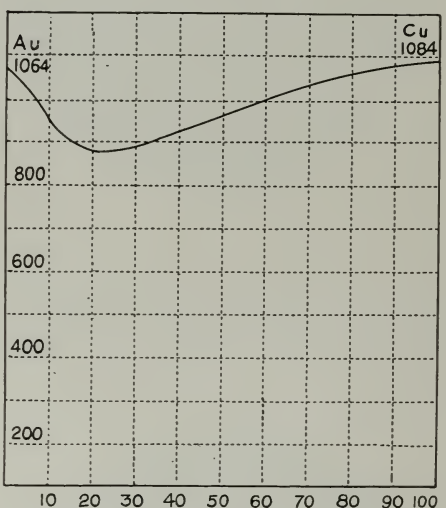
In Fig. 19, II to IV, the density line is given for an alloy of which the components remain in solution up to a cer-

Fig. 17.



Weight % Ag.

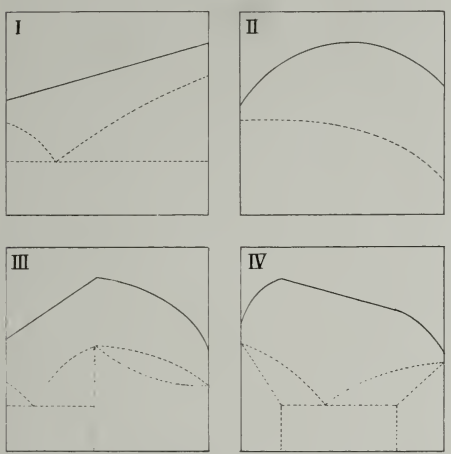
Fig. 18.



Weight % Cu.

tain percentage. The line, therefore, consists of three parts—a rising, bent section for each field of mixed crystals, and a straight one for the field lying be-

FIG. 19.



tween the mechanical mixtures of these two kinds of mixed crystals.

PRACTICAL VALUE OF DIAGRAMS.

When we consider that for each alloy a coefficient can be determined for the density and for the other technical properties, then it becomes evident that a diagram gives us more than merely a succession of temperatures. Figs. 17 and 18 show that gold can unite in all proportions with silver, as well as with copper, to form an uninterrupted series of mixed crystals, and that these alloys probably will be useful. With the diagram before us we can see how gold and tin will form a chemical union, and therefore, probably, are mutually satisfied. Lastly, with the aid of the diagrams it is possible to say in advance which metals we have to melt together, and in what proportion, in order to obtain a useful material with the best chance of success.

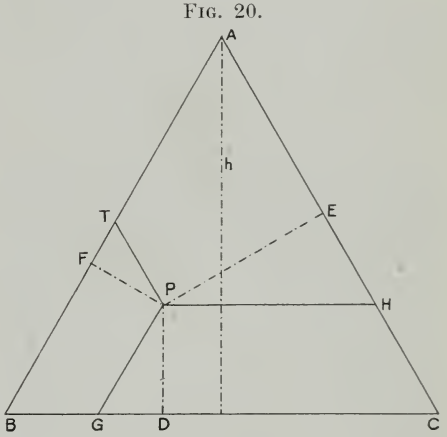
Finally, I desire to convince the practitioner of the advantages of this graphic method by giving him a more detailed example.

A great number of low-fusing alloys, such as Rose's, Wood's, and Watt's metals, are in the market. They consist nearly always of lead, tin, and bismuth. Suppose we were required to find the proportion of the metals to be contained in a new alloy, how shall we go about it? First, it will be necessary to lay down the requirements which that new alloy must answer. These, in view of the use to which we wish to put the alloy, concern principally the melting-point or the density—the manufacturer, of course, is chiefly interested in the price.

CONSTRUCTING DIAGRAM OF FUSING-POINT OF TERNARY ALLOYS.

In order to obtain a clear idea of the question of fusing-points, we have to construct a C. T. diagram. So far we have only discussed binary alloys and diagrams thereof. Now, however, we have to consider three metals. The construction of a ternary diagram will therefore be briefly explained. For three components we indicate the concentra-

FIG. 20.

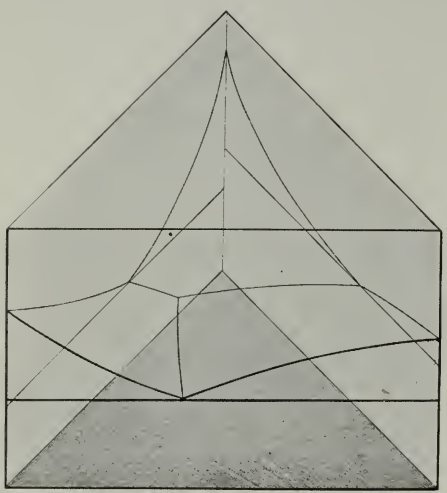


tion, not by a point on a line but by a point in a plane, and this in an equilateral triangle. We make use of the fact that the sum of the three perpendiculars drawn from any point within the triangle (see Fig. 20), to the sides, equals the height of the triangle—thus, that PD + PF + PE = h; and further, that the sum of the three lines drawn

from P parallel to the three sides equals one of the sides of the triangle; thus that

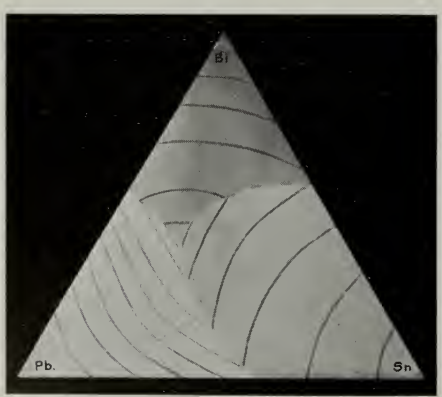
$$PG + PT + PH = AB = BC = CA.$$

FIG. 21.



Point P is perfectly defined by the length of these lines; on the other hand, we obtain the lengths of the lines PG, PT, and PH by knowing point P.

FIG. 22.

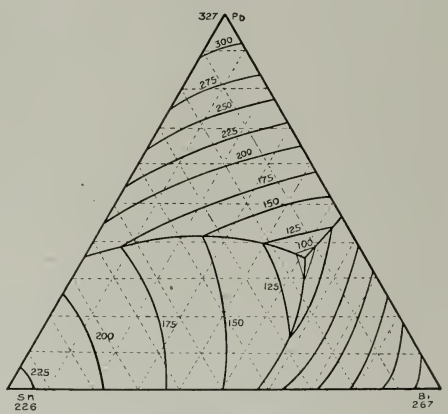


Let us now indicate the concentration of each of the three components by the lengths of these lines, making the length of the side of the triangle 100; then we obtain the construction of the ternary alloy by knowing any point within the triangle.

We now erect on each of the sides of the triangle a plane perpendicular to the plane of a triangle.

Those three planes will intersect along the lines A, B, and C, at right angles to the base, which lines will form the edges of a prism thus formed. On each of the surfaces of the prism we draw, on the same scale, one of the binary diagrams Pb-Sn, Sn-Bi, and Bi-Pb, in such a way that Pb joins Pb, Sn Sn and Bi Bi. Thus we obtain Fig. 21. The temperatures will be indicated on each of the

FIG. 23.



C. T. diagram.

three edges of the prism. Now we can imagine planes going through the corresponding points of these three temperature scales. These planes will be parallel to the base and indicate the temperature for the entire ternary system. Therefore, we call them *temperature planes.*

Furthermore we can erect planes through the melting-lines; these will form the *melting plane,* which can be intersected at a definite height by the temperature plane. The secants of the melting plane with the temperature plane are called isotherms (see Fig. 22).

A projection of all this on the base, on which already a co-ordination system

has been drawn, gives the useful form of a ternary diagram (see Fig. 23), as it was first constructed by Charpy. It enables one to find easily every desired fusing-point between 327° and 96°C. in different concentrations of lead, tin, and bismuth.

On the manufacturer's requisition we can quickly furnish the most complete information.

The second requirement is then to be considered, viz, density. The binary diagrams Bi-Pb, Pb-Sn, and Sn-Pb, as they are represented by Charpy, are not entirely correct. Instead of forming in all concentrations mechanical mixtures at crystallization, the components possess a partial solubility in relation to each other. Where, as previously stated, we obtained for the density of mechanical mixtures only the average percentage of the densities of the components, one could always expect a large increase in a field of mixed crystals. The presence of these fields in the present case gives us, therefore, a favorable prognosis. We will try, however, to obtain a complete view of the different degrees of density which we may reach in combinations of the three metals named.

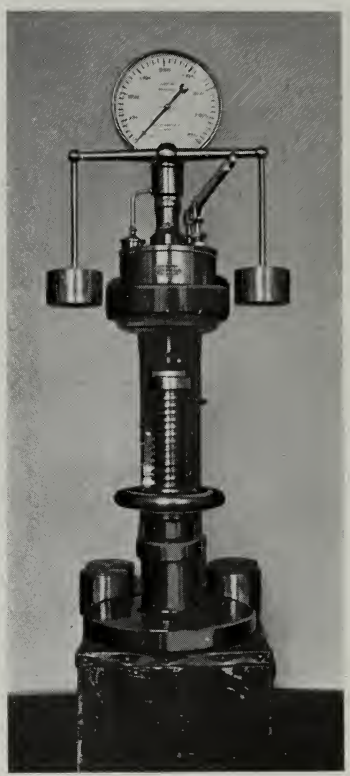
CONSTRUCTING A TERNARY DENSITY DIAGRAM.

For this purpose we will try to construct a *ternary density diagram,* in the same way as the C. T. diagram was obtained.

Naturally it will be necessary to use an instrument with which we can determine the density of the different alloys. For this purpose the metallurgical laboratory of the Dental Institute uses the bullet-pressing machine of Brinell (see Fig. 24). By this machine a bullet of hard steel is pressed with a certain force into the surface of the material to be examined. The size of the impression thus procured serves as a basis for the determination of the density. If we divide the number of kilograms of pressure by the number of square millimeters of the spherical surface of the impression, then we will get the pressure exercised per square millimeter. This number is now used as a measure for the density, and is called the Binell *density number.*

The density number was thus obtained for the fifty-seven alloys the concentrations of which are marked by the points

Fig. 24.

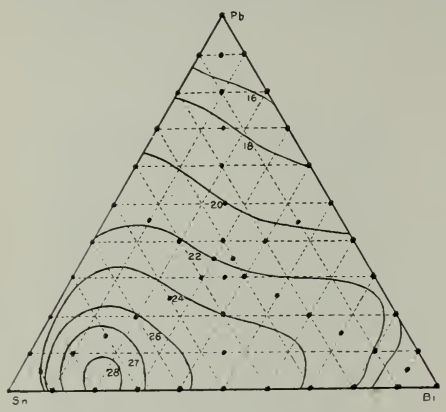


in Fig. 25. Thus it is possible to form three *binary* H diagrams from the numbers obtained for the alloys along the sides of the triangle. The values which correspond with the points in the three altitudes of the triangle further indicate the way to draw the (ternary) plane of density through the binary curves.

Finally the lines of intersection of horizontal planes with the plane of density are the "even-pressure lines," analogous to the isotherms. Such a line represents a series of alloys which are

all of the same density. Some of these pressure lines have been projected in Fig. 25, giving us also the density. For comparison, a few H numbers of well-

Fig. 25.



Brinell diagram. H-300.

H = Brinell density number; 300 stands for 300 kilogram pressure.

H-300 is for—Zinc = 41.00.
Babbitt = 28.50.
C. B. = 20.00.
Bismuth = 12.50.
Tin = 8.50.
Lead = 5.60.

known materials have been added. Fig. 25 thus is the ternary H diagram Pb-Bi-Sn.*

* No theoretic conclusions are to be drawn from this diagram, which was prepared merely for practical purposes.

The two diagrams, united in one drawing, enable us to decide at a glance in how far any alloy, consisting of Pb, Sn, and Bi, fulfils our requirements as to fusing-point and degree of density. It is noticed that the union of the lowest fusing-point with the highest degree of density, a desirable end to obtain, is impossible. Therefore, it would be advantageous to choose an alloy specially fit for the work intended. For pieces of smaller circumference, consisting of a soft material, as for instance a swaged crown, it is desirable to use an alloy with a low fusing-point. The fact that one has to content himself, then, with a density of about 21 need not be any objection against the use of a combination appearing on the isotherm of 100 degrees. On the other hand, it would be better when using a Jacobsberg's apparatus for swaging full or partial plates, to use a metal of higher density, *i.e.* of that of Babbitt, while the increase in the fusing-point up to 175° or 200°C. would not be objectionable in a piece of work of so much larger dimensions.

In the above I have tried to give my views of metallurgy, which are more modern than those found in our latest text-books. In a short paper of this nature it is impossible, of course, to discuss the subject in its entirety. I hope, however, to have made clear to those interested in our Dental Institute the spirit in which we expect to teach this subject.

PROCEEDINGS OF SOCIETIES.

NATIONAL DENTAL ASSOCIATION—SOUTHERN BRANCH.

Sixteenth annual meeting of the Southern Branch of the National Dental Association, and the forty-seventh annual meeting of the Georgia State Dental Society, held at Atlanta, Ga., June 4, 5, and 6, 1914.

(Continued from page 575.)

SATURDAY—*Morning Session.*
(Continued.)

The next order of business was the reading of a paper by Dr. ROBIN ADAIR, Atlanta, Ga., entitled "Early Symptoms of Local and General Disease as Manifested in the Mouth," read in part as follows:

Symptoms of Local and General Diseases as Manifested in the Mouth.

By ROBIN ADAIR, B.S., M.D., D.D.S., Atlanta, Ga.

Dr. C. H. Mayo read a paper in Chicago on January 31, 1913, in which he made the following statement: "It is evident that the next great step in medical progress in the line of preventive medicine should be made by the dentists." This declaration gave a great boost to modern dentistry, and is a challenge for our profession to sever all remaining ties with charlatanism and to come into our own.

Whatever has been our delay in the past, it now behooves us, for the sake of the challenge of such an authority as Dr. Mayo, and for the sake of humanity itself, to begin this advanced service.

To support and contribute to some far-off oral hygiene movement is good; to enlist in the dental examination of school children is good, but the point the essayist wishes to make is that the hour has arrived when the dentist's *clientèle* must receive better attention than the mere filling of teeth or other restorative work.

We remember that some years ago some of our leading dentists became very much wrought up over the publication of the classical essay of Dr. Wm. Hunter of London. At the time of its publication this paper was taken to be a reflection upon American dentistry; in this short time, however, the tide of disfavor has turned to one of favor, and all dentists who are making any investigations along this line, or treat diseases of the mouth, know that this essayist did not exaggerate the awful picture which can be found in many a patient's mouth.

When our profession can accept and will correct such accusations, with proof taken from *ordinary* practice, just so soon will the medical profession come to us with a full recognition of work well done, and then will they seek our services for what knowledge we can give them, for the sake of relieving suffering humanity.

MEDICAL ESSAYISTS BEFORE DENTAL MEETINGS, AND VICE VERSA.

For the sake of comparison of the present relationship of the two profes-

sions, and with no purpose of criticism, your attention is called to the fact that very few dental conventions are held without a paper being read by a prominent physician. This is an excellent plan, and we always obtain valuable information from such sources, but is this confidence and courtesy returned? We can find only a few instances in which a dentist has been asked to read a paper before a medical meeting.

In the future, dentists and physicians must be more closely allied, not only for our mutual advantage, but for the general welfare of our patients. The best way I know of is to take the advice of Dr. Mayo. When we, as a regular practice, begin to make serious examinations for *general* symptoms due to diseased mouths, and not only cure but prevent them, the day will come when all medical conventions will contain in their program a paper from some dentist.

The few papers which have been read before medical conventions in the past by dentists have been generally written by those who are graduates of medical schools, and appeared not because they were dentists, but because they had the right to participate in the proceedings on account of their medical affiliations.

[The essayist then related his pleasant experience in reading a paper on a dental subject before a medical society and cited the history of a case of grave systemic disease due to oral infection, which terminated fatally owing to the belated recognition of its dental origin.]

There are thousands of like cases going to their doom, just because we do not, as a general rule, recognize the early symptoms of general disease due to mouth infection. The point I want most to emphasize is that it is imperative for the physician to know—and he must be taught by the dentist—that diseases of the teeth and mouth are the most prevalent, and that the early diagnosis and treatment of such infections are most important; otherwise they may develop into dangerous infections with fatal results.

NECESSITY OF THOROUGH DENTAL TREATMENT.

Often patients have been referred to the dentist from the physician. We probably find a septic mouth and point out the danger to the patient; then the physician advises against any dental work being done, saying that the patient is not strong enough. Had the same patient a bleeding ulcer in any other part of the body, such advice would not be given, and proper attention would not be delayed. Often the patients come to us for temporary treatment only, hoping to get well before having permanent work done. We all know that most of them, instead of getting well, go from bad to worse, and instead of coming back to the dentist, probably go to the hospital. I took the opportunity to stress a mistake often made by the physician, and I mention it here so that we may all try to overcome this tendency in our medical friends.

Should the dentist give the temporary treatment often advised by the physician, many times the visible symptoms will be covered up, and unless the physician is familiar with the pathological conditions in the mouth, he often fails to cure the patient of some general disease.

PYORRHEA ALVEOLARIS AND ITS POSSIBLE SEQUELÆ.

Let us take, for instance, a case of pyorrhea alveolaris. In a general way this term embraces every pathological condition in the mouth, from a discharge of pus to the molecular disintegration of the alveolus with no pus present. The disease varies from irritation of the mucous membrane, which may allow the absorption of ptomains into the human system, to violent infection with accompanying alveolar abscess; from tumefied, bleeding gums to the final loosening of the teeth. Let us demonstrate to our medical friends that patients may have a mouth disease, even though there be no pus oozing from around the teeth. For the good of the patients, all of the above symptoms should be recognized early.

From a close study of mouth infections, I know that they never get well without dental interference. Even the patient with a low-grade infection may suddenly lose his immunity, and a sudden toxemia may develop which is difficult to cure. Even one tooth affected with pyorrhea may in the process of mastication produce the absorption of pus through the lymph channels and nodes into the system, raising the temperature to from 101° to 104°.

Whether we consider mouth infections to be the result or the cause of lowered cell resistance, let us give the physician to understand that, in making a diagnosis of an obscure case as above illustrated, the mouth must be taken into consideration, as it might prove to be of the greatest etiological importance.

CONCLUSION.

It is my conviction regarding this subject which has led me to emphasize the fact that by the early recognition of the symptoms of mouth diseases the best curative results can be secured. By devoting a little more attention to this work, the dentist could not only increase the efficiency of his office practice, but he as well as the physician would be called to the bedside of the patient, not always to treat, but to prevent. Such preventive dental treatment is just as important as treatment by the physician or surgeon. Just a little more attention and a little more practical work along these lines will bring about the appointment of a dentist to the staff of every hospital, not merely for the honor, but in order that every patient who enters the institution may receive mouth treatment, both upon his entrance and during his stay there. We shall then find that all our demands regarding oral hygiene will be accomplished in something more than a half-hearted way.

Discussion.

Dr. T. P. HINMAN, Atlanta, Ga. The question of mouth infections is one with which we are all more or less familiar; the only trouble is that the importance of this question has not been driven home. As an illustration, I believe that a large percentage of dentists, probably a good many of those present, have mouth infections. There is no question that oral infections cause severe systemic disorders. It is true that a great many of our most prominent surgeons do not perform abdominal operations without first having the oral cavity cleansed. I have been charmed at the manner in which the medical profession of this city have received information about mouth infections, and am surprised sometimes to see how well posted some of them are as to the mouth being a focus of infection. The rank and file, however, of the medical profession are not any better posted on this subject than the rank and file of the dental profession. It is a question of education. Each and every one who has heard this paper should be a teacher of medical men. The medical man does not oppose us; he is just as practical and as amenable to reason as any of us; it is just a question of bringing the matter to his attention in a nice way. It is astonishing how they absorb such information, and how willing they are to co-operate with us when they know the facts. If more papers on the subject of mouth infections as the cause of systemic troubles were read, and reprints were sent to medical men, we would perhaps obtain more co-operation, which we cannot secure by fighting them.

The essayist does not go into the question of early diagnosis as much as I expected. This is not said by way of criticism, but because I feel that the average dentist does not duly appreciate the importance of early diagnosis. Every now and then we observe in young patients well developed pseudo-pyorrhea, which means simply filthy mouths. These accumulations of pus around the teeth suggest the presence of pyorrhea. We should, however, be able to differentiate between the various forms of pyorrhea, pseudo-pyorrhea being nothing more nor less than a deposit and infection at the gingival border, upon the simple removal

of which the mouth requires no further treatment. I have seen cases with distinct marginal infection in patients of eight years of age. The first step, in my judgment, that the operator should take when a patient presents is to examine, not the teeth, but the mouth and gums. It has been my practice to pass the index finger over the apices of the teeth, and not infrequently I find a blind periapical abscess. These are invisible infections, which, however, are the most dangerous. When bacteria are carried to the stomach the juices of that organ exert an inhibitory effect on their productiveness, and their absorption is much slower than when it occurs directly into the system through a blind periapical abscess. Knowing this, we should pay more attention to blind abscesses. A great many distinct infections of a dangerous character arise from blind periapical abscesses, and their cure, in my estimation, is more imperative than that of strictly marginal infections of the gums. I am glad to have heard the paper, and wish to congratulate the essayist on bringing this matter to our attention.

Dr. C. M. Barnwell, Atlanta, Ga. We all know that an ounce of prevention is worth a pound of cure. The chief reason why some patients' mouths show such bad cases of pyorrhea or gum infections is that we neglect them in the early stages. If we would observe prophylaxis as thoroughly as we are beginning to preach it, I think the cases of such infections would be fewer. The chief obstacle, however, seems to me the lack of time or disposition on the part of the dentist to do prophylactic work. He is handicapped in a way by the lack of education of the laity, who are disinclined to remunerate him for his efforts. The operator, on the other hand, is busy with another kind of work which is more remunerative, and he feels that his time can better be spent than in prophylactic scaling and cleansing of the patient's teeth; consequently he is disposed either to let that work go, or to turn it over to his assistant. The chief difficulty with an assistant is that as soon as he has accumulated a practice sufficient to keep him busy, he is in the same position as the operator—he wants to do other work. Consequently the dentist's *clientèle* are changing from one assistant to another, which is not at all agreeable to them, because they feel that the operator himself should be looking after their work.

I believe that the most urgent need of the dental profession at present is the dental nurse. You have heard this subject discussed pro and con many times, but I do not believe we are any nearer to having the trained dental nurse than we were at the beginning. Certainly no definite form of legislation has been enacted that will secure for us such an adjunct to the dental office. If we had trained nurses, like the medical profession, we could do better and more thorough prophylactic work. Whenever this question has been broached, the objection has been raised that this means laying open the doors of dentistry, and that, after being licensed to do this work, these nurses soon will be practicing other branches of dentistry without being licensed therein. I do not see any reason why that danger should be greater in the dental profession than it is in the medical profession. Of course trained nurses do practice medicine in a limited degree, that is, they prescribe for patients occasionally; still, they do not practice medicine, and we very seldom hear of a trained nurse interfering with a regular practitioner of medicine. I believe that the same provision will be made in dentistry before long. I know that in some cities dental nurses are being employed irrespective of the fact that there is no law licensing the nurse. I think we should work to the end of securing dental nurses, because we shall then better be able to carry on the propaganda of prophylaxis than heretofore.

Dr. Adair (closing the discussion). In reply to Dr. Hinman I will say that he probably misunderstood my reference to the medical profession. There is nothing farther from my mind than fighting them. I fully realize that it is only through co-operation with the med-

ical profession that the best results can be obtained.

In reply to Dr. Barnwell, I will say that in my own office I have solved the prophylaxis question for some four years with a dental nurse. Some of you may remember that I brought this question up before the state society at Cumberland a number of years ago, and it was the consensus of opinion at that time that if any practitioner wanted to employ a trained nurse in his office, he could do so without objection. My nurse does no dental work; she simply cleans teeth, and does it thoroughly. It may be a matter of information to some that Dr. Fones of Bridgeport, Conn., graduated this month a large class of dental nurses. Dr. Shaw of Seattle, Dr. Skinner of Chicago, and many practitioners all over the country have dental nurses in their offices, and I believe that this institution is going to solve the problem.

The one point that I want to emphasize is that we all need to know more about mouth infection, and to put such knowledge into practice. When we have a nurse or a physician in the chair, let us talk to them along this line, and tell them of the many cases where good has been accomplished by the dental and medical professions working together.

When a patient enters a hospital, every portion of his body is cleaned; even his clothes are taken off and sterilized, and his hair, finger-nails, and toenails are washed and cleansed; and yet a dirty pyorrheal mouth that contaminates the whole ward is not touched. This is wrong, because in sickness it is of the utmost importance that the food ingested should pass through a clean mouth, and not be polluted as it enters the body.

The object of my paper was in a general way to call attention to the danger of infections as a result of unclean mouths. Constantly I see bad cases of pyorrhea in which some dentist has just finished some dental work and has dismissed the patient as being all right. This is wrong; we have no right to dismiss a patient with a clean bill of health after simply filling a few teeth, and not cleaning his mouth and removing all possible sources of infection. I believe that we should first clean the teeth and mouth properly, and then do general restorative work, thereby accomplishing much more good for our patients. Let us talk this to all our patients, then such worthy organizations as the Mouth Hygiene Association will have enough members and enough money to do their work without having to go into the tooth-paste-manufacturing business.

Dr. H. W. Morgan, chairman of the Necrology Committee, asked that the committee be allowed to prepare a report for publication in the proceedings.

Motion was made and carried that the request be granted.

The report as presented by the committee is as follows:

Report of Necrology Committee.

Dr. Vines Edmund Turner.

Dr. Vines Edmund Turner was born in Franklin county, N. C., on January 21, 1837. He was graduated in dentistry from the Baltimore Dental College in March 1858, and practiced at Henderson until the beginning of the civil war.

He entered the Confederate service as second lieutenant, but was promoted later to captain, serving on the staff of General James A. Walker. He was wounded at the battle of Cold Harbor in 1862.

In the early '70's he moved to Raleigh, where he continued in the practice of dentistry to the time of his death, May 11, 1914.

Throughout his life he was a recognized leader of ability, high convictions, and earnest purpose, loyal to his state, an honor to his profession, a consistent churchman, and in his home life a devoted husband and father. The following are some of the positions of honor he held: In 1881 he was president of the Southern Dental Association; in 1887 vice-president of the Dental Section of the Ninth International Medical Congress; president and director of the Raleigh Street Railway Co. at its organization in 1887; for thirty-four years, from 1881 to the time of his death, chairman of the state board of examiners; president of the Jamestown Dental Convention, 1907; president of the

National Association of Dental Examiners, 1901; treasurer of the National Dental Association, 1904–06; president of the National Dental Association, 1908; member of the United States Navy Reserve (Dental) Board, 1913; a director of the North Carolina Railroad Co. for eight years; a director of the Raleigh Savings Bank for twenty-seven years; a vestryman and junior warden of Christ Church for twenty-five years; a charter member of the Capital City Club, Raleigh; a member of the Masonic fraternity, etc.

These activities are sufficient to attest the esteem and respect in which Dr. Turner was held by the community in which he resided, by his profession, and by the government of the United States. One who knew him has paid him the following beautiful tribute: "One of the most prominent laymen of the diocese, his counsel was sought in the work of the Episcopal Church as well as in many departments of civic life. His religion was of the simple and practical kind which accepts service as obligation, shoulders responsibility, gives unostentatiously and liberally, and practices without preaching. He believed in his fellow creatures, and helped and stimulated them by the sheer force of that belief. He never cringed to any, and neither sought preference nor was elated when it came unsought. He honored womanhood, he loved little children, he was deeply loyal to his friends and to his state, he was gentle to the unhappy, and he withheld blame from the unfortunate. He had the instinct of comradeship, a quick sense of humor, a charm of manner, and an unfailing courtesy."

He met life gallantly, with a smile on his lips and with faith in his heart. Some call this "the spirit of knighthood," but in the South we still like to say, "a gentleman of the old school." Their passing leaves us poorer! Yesterday the governor of the state spoke of Dr. Turner as "the town's best-loved citizen." The phrase seems to sum up his whole life, for his name is "written as one who loved his fellow men."

Dr. Turner was twice married, first in 1868, to Miss Rozena Lassiter of Henderson, who died in 1869. In 1874 he married Miss Love Gales Root of Raleigh, who with three children—Dr. Chas. R. Turner of the University of Pennsylvania, Philadelphia, Dr. Henry G. Turner, and Mrs. Henry M. Wilson of Raleigh—survives him.

The Southern Branch of the National Dental Association has learned of the death of Dr. Turner with sincere sorrow, and as an expression of the esteem in which he was held adopts the following resolutions:

Resolved, That in this death the profession of dentistry has suffered the loss of one of its most faithful and honored members, one who was justly entitled to the love and regard of his associates throughout his long career, and one whose efforts at all times were directed to the promotion of the highest interest of the profession of which he was a devoted member; and be it further

Resolved, That this preamble and resolution be spread upon the minutes of our annual transactions, and that a copy thereof be engrossed and sent to the bereaved family.

Henry W. Morgan, *Chairman*,
H. H. Johnson,
Committee.

Dr. Simeon Bales Cook.

Dr. Simeon Bales Cook was born in Sweetwater, Tenn., May 2, 1852. He died at Chattanooga, April 22, 1914. He was the youngest of nine sons, and was graduated with highest honors from the Ohio Dental College in 1881. He practiced dentistry in Sweetwater until he removed to Chattanooga in 1886. He married Miss Hattie Wayne, daughter of Mr. O. H. P. Wayne—a descendant of General Anthony Wayne—in 1896, who with four sons survives him.

Dr. Cook early in life joined the Methodist Church, and led a Christian life of the purest type, being prominent in all good movements and generous with his time and money in advancing every good cause. He was also a faithful member of the Masonic fraternity. Skilled in his profession, he commanded a large practice, and was an active member of the State Dental Association. For many years he was a faithful member of the state board of examiners, appointed by the governor of the state, and was largely responsible for the high character of the work accomplished by that organization, which held him ever in the highest esteem for his faithful services to his state.

Resolved, That the intelligence of the death of Dr. S. B. Cook is heard by the members of the Southern Branch of the National Dental Association with much regret, and that our sympathy is extended to the bereaved family and to the profession of the State of Tennessee, of which he was an ornament, with the promise of yet many years of usefulness; and be it

Resolved, That these expressions of our regret be sent to the family and spread upon the minutes of our transactions.

Henry W. Morgan, *Chairman*,
H. H. Johnson,
Committee.

The next item on the program was the reading of a paper by Dr. S. L. Silverman, Atlanta, Ga., entitled "Dentifrices and Mouth-washes," as follows:

Dentifrices and Mouth-washes.

By S. L. Silverman, D.D.S., Atlanta, Ga.

The most important quality that is claimed for a dentifrice or a mouth-wash is its chemical reaction. The manufacturers and also the authors of various preparations mention and praise only the chemical reaction of their products. Yet this mainstay, that is, the much-lauded and applauded alkaline reaction, in the light of our present knowledge seems to be losing its hold, and to be superseded by favor for a decidedly acid reagent—for these many years the bugbear and scapegoat!

Exhaustive work in this field has been done by Wallace of England, Pickerill of New Zealand, and Gies of Columbia University. Before, however, going into Professor Gies' theory of the prevention of caries, and as to the proper agents for the mouth toilet, let me say that his statements on this subject are by no means final, and that he has been commissioned by the Research Committee of the National Dental Association to continue his studies and verify his conclusions.

This action on the part of our committee is destined, in the course of events, to settle once and for all the problem of mouth preparations and their reactions, and will not only benefit humanity in general, but end a discussion that has lasted for over a quarter of a century and has aroused untold strife and contention without producing the least tangible result.

Professor Gies has engaged the co-operation of every department of the Columbia University that could at all help in clarifying this subject. Their findings, so far, all concur in and corroborate the statement of J. Sim Wallace that alkaline mouth-washes and dentifrices not only are impotent and inefficient, but that they are probably, and in many instances actually detrimental.

Some of our *confrères* have expressed the opinion that mouth-washes in general are useless and inefficient, and prefer a tooth-paste or powder to be applied with the brush, so long, of course, as the brushing is executed correctly.

In answer to this opinion, let me ask these men whether, after a thorough brushing of the teeth with any of the dentifrices on the market or any preparation prescribed by them, they have not been able to remove mucoid matter with an instrument from the cervical margins of the teeth. When we remember that dental caries occurs by predilection in these areas, the inefficacy of dentifrices is obvious.

LIMITED VALUE OF THE TOOTH-BRUSH.

Professor Gies has found an acid preparation, harmless to the teeth, which disintegrates these transparent mucin plaques and leaves the tooth really clean. But before discussing this phase of my subject, I would say a few words about tooth-brushes and tooth-brushing. Tooth-brushing is as old a practice as religion. Throughout ancient Egyptian, Greek, and Chinese literature may be found innumerable references to tooth-powders and tooth-cleansing. The work of our great historian, Guerini, fairly abounds with such information. But the ancients employed the tooth-brush only for the cosmetic results obtainable from it, and in their enthusiasm they did not assign to it any curative virtues in diseases of the mouth. At the present time, however, enthusiasm attributes to the tooth-brush qualities that science cannot credit it with.

I am well aware that the tooth-brush is too old and venerable a commodity to be assailed with impunity, and nothing is further from my intentions than to denounce it, *per se* and unequivocally. I believe that as an aid to dental toilet for cosmetic and esthetic purposes it has its place, but to attribute to it the power of thoroughly cleansing the teeth and of preventing caries is a misleading exaggeration.

Since the tooth-brush is a fallacy, and

since floss silk, while it removes the greater part of the débris mentioned, slips and glides over the glutinous plaques—which are the most important deposit to be removed—it behooves us to procure some agent that will not only aid in the mouth toilet, but will have a sialagogic effect, since it cannot be disputed that a thin, copious saliva is essential in keeping the teeth bathed and inundated.

EFFECTS OF ORGANIC ACIDS UPON THE SALIVA.

The agent that can best accomplish this aim is an organic or better still a fruit acid, such as citric or acetic acid. Soon after the ingestion of a piece of lemon, for instance, the saliva is found to be decidedly alkaline, even though particles of lemon are present in the mouth. This is also the case after the use of dilute vinegar. Not only will the saliva have a decidedly alkaline reaction two minutes after rinsing with an acid mouth-wash, but there will be an increased and prolonged flow of saliva following such treatment. This is apparent even to the extent of a reflex action. For if we see a lemon being cut, or ourselves cut one, or, indeed, if we merely think of a lemon being cut, saliva commences to pour from our salivary glands, and its chemical reaction will always be found to be alkaline, as we can roughly prove by testing with a piece of litmus paper.

The results obtained by the investigators in this field are so self-evident that it is astounding that it required such a long time to learn and apply them. Most of the experiments of these investigators we can make ourselves. For instance: Nearly all acids are sialagogues, viz, they stimulate the flow of saliva; the mineral acids, however, are weak in this property. Further, not only is the amount of flow increased, but it continues for some time after ingestion of fruit acids or by an acid diet or by the use of an acid mouth-wash. Finally, fruit acids not alone increase the amount of saliva and prolong the time of its flow, but increase the alkalinity index itself.

In discussing salivary stimulants it is natural to investigate also salivary depressants, viz, agents that decrease the flow of saliva and the alkaline index. Strange to say, these agents which stand pre-eminent by their antisialagogic qualities are no less well known than the alkaline dentifrices and mouth-washes.

How strange that from the whole realm of inorganic and organic chemistry we should have chosen and used the most pronounced enemy of a sufficient flow of alkaline saliva! Were it not for the little antiseptic incorporated in the ordinary mouth preparation and the saccharine addition which imparts to it a pleasant taste, we should probably have wrought greater havoc than has actually been done.

USELESSNESS OF ANTISEPTICS.

Speaking of the antiseptics which are found in the ordinary wash or dentifrice, I ask in all seriousness, how could we, and how can we, ever think that a mild antiseptic or germicide held in the mouth for the brief period of a minute could interfere with germ propagation? We know that it takes fifteen minutes of boiling to kill most pathogenic germs, and that it requires a much longer time to kill putrefactive germs. Realizing the futility of this use of mild antiseptics, and the frequency with which they are employed, we shall again take up the problem in hand.

THE VALUE OF FRUIT ACIDS.

For a good many years we have been eating sapid sticky food, and then, to top the climax, we literally ate chalk. Had we only looked about us and partaken of the fruits and berries so abundantly supplied by her, we could have at least helped Nature. More than that I believe we cannot do.

Let me ask those who might say that fruit acids are harmful to the teeth, a question, using the words of Professor Gies. (By way of parenthesis, I might

say that the experiments with numerous fruit acids showed that they were capable of eroding the teeth, if left upon them in sufficiently strong solution and for a sufficient length of time. But in the mouth, where a flow of alkaline saliva sets in as soon as the afferent nerves are stimulated, the condition is entirely different.) Professor Gies asks, "Would a hundred maximum medicinal doses of strychnin do as much harm, by regular successive medicinal administrations to a given individual, as an overdose equal to one hundred medicinal doses? Or would a college yell of 1000 voices at a football game make a noise like a riot, if the 1000 voices piped one after another?"

The inference, of course, is plain—namely, that while a tooth will dissolve if left indefinitely in citric or acetic acid, yet it will not be affected by a weak acid solution that is immediately neutralized. Pickerill and Wallace not only advocate acid mouth preparations, but also an acid dietary, and recommend that our meals should commence and end with an acid-reacting appetizer and dessert respectively.

Their experiments in this field have resulted in startling observations. Thus it was found that bread and butter, probably on account of the emollient, is a salivary depressant; meat was also found to be a depressant. Some articles of diet, such as the sweetly flavored, were found to be salivary stimulants, but they depressed the alkaline index.

Pickerill and Wallace point out that our diets are conducive to dental caries. For instance, sweet, sticky, and pappy desserts, bonbons and the like, usually complete our meals. This I think is true of nearly all civilized races, and of all classes, rich and poor alike.

The results of procedures based upon the above suggestions are nothing short of miraculous in their beneficial effect, not only upon the oral cavity, but upon the entire digestive canal.

CONCLUSION.

In conclusion, I wish to reiterate that, since mechanical cleansing with the tooth-brush is impossible, even in the hands of the most expert, it behooves us to employ some agent on the irrigating principle which, by its chemical properties and physiological effects, will of its own accord disintegrate the mucin plaques and allow the saliva to bathe all of the surfaces of the teeth. Further, though some food débris remains in the interproximal spaces, this débris should be penetrated and deprived of its glutinous, hence deleterious properties.

Fruit acids, as has before been pointed out, seem best adapted for this purpose, and persons who have employed them for the past five years show no erosion, but testify to their beneficial effect, and exhibit no dental caries.

Now the question arises, What is the best fruit acid for this purpose? Dilute apple vinegar, on account of its easy availability, also on account of its inexpensiveness, qualifies very satisfactorily. The taste of vinegar is, however, objectionable to many, but as has been pointed out by Professor Gies, the flavor of any fruit acid can be entirely submerged by nearly any other flavor that is preferred. I have selected for this purpose the compound spirits of lemon and orange, a few drops of which destroy and absolutely submerge the disagreeable vinegar taste and odor, and impart to it a flavor that can certainly not be disagreeable to anyone.

I communicated this information to Professor Gies for his approval, which it met, and I can therefore recommend it. In fact, any flavoring agent may be employed that is not sufficiently alkaline to interfere with the acidity of the base.

The question of diet surely deserves careful observation, in order that the hypothesis of the investigators in this field may be corroborated. It seems probable beyond any doubt that the conclusion of a meal with sweet, glutinous desserts or bonbons is an incorrect practice, to say the least, for these foodstuffs adhere to the tooth surfaces, imprisoning the agents that most likely cause dental caries. Moreover, while they slightly increase the flow of saliva, they always de-

crease its alkalinity. This deplorable fact is especially apparent when salivary depressants such as alkaline mouth preparations are employed subsequent to the ingestion of such foods.

I have myself employed an acid mouth-wash for the past ten months thrice daily, and can discern no detrimental result.

Discussion.

Dr. H. H. Johnson, Macon, Ga. The essayist has presented to us a paper that may be of benefit to a great many dentists. He suggests that a mouth-wash should have an acid reaction. In making up a mouth-wash, however, we have to take into consideration what we wish to accomplish therewith. If it is to be used as a deodorizer, we must have one formula; if it is intended to produce healing of the tissues of the mouth, we must have another formula; and if it is intended to be used for sterilizing the mouth and destroying bacteria, we must have still another formula. I have myself made a study of formulas for mouth-washes in years past, and I believe that, if we wish to incorporate as many of these qualities as possible in one formula, it would in all probability have an acid reaction. Such acid reaction does not necessarily indicate the presence of an acid of a nature destructive to the dental tissues. There are many acids that will turn blue litmus red, and yet are not harmful to tooth tissue. Sulfuric acid is destructive to a certain extent. Hydrochloric and citric acids are probably the most destructive agents that could be included in a mouth-wash. The essayist's analogy with the boiling method of killing bacteria is not well chosen. We know that solutions tolerant to flesh can be made that will destroy bacteria; if this were not true, surgeons would not use antiseptics in their work, as they would be useless. Why does the surgeon apply what he calls an antiseptic dressing to wounds if it is not to destroy germs and prevent infection? I believe that a germ-destroying wash can be made that can be tolerated in the mouth; that the mouth can be purified and sterilized by mouth-washes alone, if these are used in the right way. Of course, it may require a certain period of time for the wash to act upon the germ life present, but I believe oral bacteria can be destroyed, that mouths can be sterilized, at least to a great extent.

I cannot agree with the essayist in regard to the abolition of the tooth-brush. We know that mechanical cleaning is good, though every little crevice be not reached, and there may be some colonies of germs left after as thorough mechanical cleaning as we can indulge in by all the approved processes; yet the number of germs is reduced very materially, and this reduction must be beneficial even if we have not exterminated the bacteria entirely. I believe that we can wipe the polished surfaces of an instrument so clean with a towel that there will be scarcely any germs left upon it. Any means by which the number of bacteria is reduced, I think beneficial. The health authorities, in inspecting the milk supply in our cities, say in their requirements that 200,000 bacteria to the cubic centimeter of milk are permissible, but an excess of that number will condemn the milk. Similarly, by partly sterilizing the mouth, we reduce very materially the danger of bodily infection.

Dr. R. C. Young, Anniston, Ala. When I first read Pickerill's article advocating the use of an acid mouth-wash I was somewhat startled, because we had always considered an alkaline wash to be proper. On further reading, however, I discovered that the writer was not advancing a new theory at all. Garretson in his notable work on dentistry recommends an acid mouth-wash for certain conditions, but as Dr. Johnson said, all mouth-washes should have a specific purpose. In cases with particularly ropy and very thick saliva an acid mouth-wash is indicated. In other mouths such a small amount of saliva is secreted that we could almost insert a large contour gold filling without the use of the rubber dam. You have all seen cases of stomatitis as the result of

tincture of iodin taken as a tonic. The reason of this is that the mineral acid, on reaching the circulation, makes all the secretions acid. Fruit acids will neutralize the secretion and combat the stomatitis. Williams made the correct statement that gelatinous plaques cannot be perfectly removed by any except mechanical means, but fruit-acid mouth-washes will soften these plaques to a certain extent, and will facilitate their removal.

We are going to make great strides in preventive dentistry in the future, but it is coming about through our knowledge of general medicine. This morning one of the essayists quoted a pronouncement by Dr. Mayo which has made the world take notice. If it had come from the best dentist in the country, that statement would have been passed by without any recognition, which shows that the physician is more of an authority than the dentist in the treatment of human disease, oral or systemic. I do not believe that an acid mouth-wash is indicated in all conditions in the mouth; we cannot make a blanket prescription that will apply to all conditions, and judgment must be used in matters of this kind.

With regard to the tooth-brush, it is no longer a luxury, it is a necessity. A person can become so expert with the tooth-brush that it can be used to much better advantage than the toothpick. I tell my child patients that it does not make so much difference if they go out without washing their faces, but they should never go out without washing the mouth and teeth. A lady came to my office the other day and remarked that if she had known she was coming to the dentist, she would have brushed her teeth. Her toilet was perfect in other respects; she had her finger-nails properly manicured, etc., but she had neglected the most important part of her toilet. This is where we can do a little missionary work at the chair, and when we come to our own, and every man who practices dentistry is an M.D., then dentistry will be a greater benefit to humanity.

Dr. H. W. Morgan, Nashville, Tenn. It is not generally recognized by those who use a mouth-wash that holding it in the mouth for a continuous period is important to gain the benefit of the germicidal effect of the solution. Most persons, when asked to give a demonstration of the way in which they use a mouth-wash, turn up the tumbler, take a sip of the solution, and after three or four rinsings throw the rest out. Persons should be instructed as much in the proper use of a mouth-wash, as in the use of a tooth-brush. They should be taught to put the wash into the mouth when they begin their toilet, and hold it there throughout the operation of putting on their clothes, taking a fresh mouthful of solution from time to time, and carrying it vigorously around in the mouth and between the teeth by applying the full force of the muscles of the cheeks, and in that way insuring the antiseptic effect of the wash. To make it rather forcible, I tell my patients that if I gave them a mouth-wash sufficiently strong to destroy the germs in their mouth in the time during which they keep the solution in it, this would destroy the teeth and gums as well.

Caution is also indicated not to confine oneself to one particular mouth-wash. Acid and alkaline washes should be alternated. The tissues of the mouth do not respond to the stimulus of an agent to the same degree if it be used for a continuous period. The tissues become less susceptible to the physiological effects of the drugs we use, just as an habitual user of morphin becomes less susceptible thereto, and has to increase the dose. Therefore we should not let the patient use the same mouth-wash throughout the year, but now and then change its character.

Dr. Silverman (closing the discussion). As regards the advisability of adding antiseptics to mouth-washes, I am quite in accord with Dr. Johnson. But it is not to be inferred that a mouth-wash during its extremely transient application has in any degree the property of preventing dental caries. It was, of course, obvious that in advocating acid

mouth-washes the teeth were to be benefited and not soft tissue lesions. In ailments of the latter sort, preparations containing zinc chlorid, potassium chlorate, etc., would be indicated; but it must be remembered that even in such ailments the use of acid preparations for the teeth is not contra-indicated. Our suggestion of acid washes does not include mineral acids, such as hydrochloric, etc., for acids of this character do not fulfil the main desideratum of the ideal wash, that is, its sialagogic effect. In fact mineral acids are antisialagogs, viz, salivary depressants. For years we have been prescribing preparations that were not only indifferent to the salivary glands, but some were actually salivary paralyzers.

As concerns the tooth-brush, I have only to reiterate that the exact center of the contact point and the area concentric thereto are the most inaccessible parts of a tooth, hence most susceptible to caries. Since the brush is ineffective in the area where it is most needed, my contention that it is in the main only an aid to the toilet and not a decay-preventer, holds good. Even in so-called soft teeth, an acid mouth-wash is desirable, for, as the researches of Head suggest, the increased flow of alkaline saliva has a tendency to harden them. Furthermore, that saliva to a great extent controls the color and quality of a tooth is best demonstrated in transplantations. Transplanted teeth at first may be entirely off color and brittle to a degree, but they soon harmonize with the other teeth both in color and strength.

Dr. B. D. Brabson. I made my report as treasurer on the first day of the meeting. In view of the fact that the Southern Branch is to disband, we will have some money on hand after all the bills are paid, and I wish the association to instruct me as to the disposition of the balance. I have also the treasurer's book, the first which was used by this organization, and which contains the records of the treasurer from the time of organization in 1869. I consider this a very valuable book, as it contains the names of many men whose memory we honor, and we should make some provision for preserving it as an historical record.

Dr. B. Holly Smith. I move, Mr. President, that after all the bills of the association have been paid, the residue left in the treasury be turned over to the Research Committee of the National Dental Association, and that the book of historical value referred to by Dr. Brabson be placed in the custody of some organization. I volunteer to say that the Baltimore College of Dental Surgery, the oldest dental college in the world, would be glad to have the custodianship of this book, until some other arrangement be made. It will be kept in the library until called for by some authorized committee of this association.

The motion was seconded and carried.

Dr. Morgan. I move that a vote of thanks be extended to the dentists of Atlanta and to our host, the Georgia State Dental Society, for the courtesies and hospitality they have extended to the Southern Branch during this meeting.

The motion was carried.

Motion was made and carried that the paper by Dr. I. N. Carr, Durham, N. C., entitled "The Violet-Ray High Frequency in Dentistry," be read by title.

There being no further business before the society, Dr. Deane declared the Southern Branch of the National Dental Association adjourned forever.

EASTERN ASSOCIATION OF GRADUATES OF THE ANGLE SCHOOL OF ORTHODONTIA.

Meeting held in Baltimore, Md., January 30, 1915.

The January meeting of the Eastern Association of Graduates of the Angle School of Orthodontia was held in Baltimore, Md., in the Rennert Hotel, on Saturday evening, January 30, 1915.

The meeting was called to order by the president, Dr. A. W. Crosby, New London, Conn., at 8 o'clock.

The secretary, Dr. Butler, read the minutes of the previous meeting, which were approved as corrected.

Dr. Weinberger spoke of an index of orthodontia which was in course of preparation for publication, and asked that the society take some action. Dr. Murlless moved that the matter of the index be laid on the table to come up at a future meeting. (Motion carried.)

The president, Dr. Crosby, then introduced as the speaker of the evening Dr. Carl W. Waldron, Baltimore, Md., who read a paper entitled "The Present Status of Adenoid and Tonsil Operations."

[This paper is printed in full at page 651 of the present issue of the Cosmos.]

Discussion.

Dr. Henry C. Ferris, New York, N. Y. I have greatly enjoyed Dr. Waldron's review of this subject, of which, for the first time, we have had a really scientific consideration presented to us. This subject appeals to me chiefly owing to my practical experience as a father. In acute tonsillitis, we first of all give the patient a cathartic, and, in the majority of cases, a thorough clearing of the intestinal tract takes care of the disease. The question arises in my mind whether acute tonsillitis is the primary or the secondary lesion in diseases of the alimentary tract. The report of urinary analysis which shows a pathological picture is really of secondary importance. Acidosis resulting from malnutrition would also show a pathological picture in urinary analysis. We find enlarged tonsils in all class III cases. It appears to me that an enlarged tonsil is really a secondary symptom rather than the primary one in cases where pathological conditions in the nasal or oral regions have been eliminated. The removal of the organ accomplishes a benefit manifested in a general improvement in the nerve tone of the patient. I would like to ask the essayist whether, in making a general examination for the histories of these cases, he examines for colitis, or has a feces examination made. I have found in a number of hospital cases that relieving the pathological condition in the oral cavity greatly reduced the size of the tonsil; but of course, where there is a suppurative condition and broken-down tissue, there is comparatively little improvement. The child usually improves perceptibly, for the time being as to general constitutional symptoms, on the removal of these tonsils, but my belief is that the improvement is similar to that which might result from the eradication of any lesion which produces a general nerve disturbance, and that, after removing the tonsils, the laryngologist usually discharges his patient as cured, when in reality he has simply removed a secondary factor, and the patient's next attack will probably be typhoid or appendicitis.

I would like to ask whether the internist is paying enough attention to the general state of the alimentary canal in

making his diagnosis of these pathological conditions.

Dr. H. E. Kelsey, Baltimore. There is one phase of this subject which I would like to hear more freely discussed. It is that portion which refers to the custom or practice of removing all foci of infection in the mouth before an operation on the tonsils is performed, and the consequent necessity of depriving the patient of certain dental organs which might often be useful, if they could first be made healthy. This is, of course, a problem that has two aspects. To begin with, we would say that, if these teeth could be made healthy, it should by all means be done before the operation, so that they may always be retained for the welfare of the patient. On the other hand, as the essayist has said, many of the patients of the dispensary type who are operated upon in the hospitals are either unwilling or unable to receive such dental service as would put their mouths in hygienic condition before the operation for diseased tonsils, and the operator, rather than risk the chance of subsequent infection from the mouth, has had many teeth removed, some permanent ones and many deciduous ones—none of course that were not affected by caries. This naturally brings us to the broad problem of providing an adequate clinic for patients of this character—a problem that both we as a profession and the public generally must face in the course of time. Much has been done in some other cities, but little here. Perhaps Boston has furnished us the best example of providing a public clinic through the establishment of the Forsyth Infirmary.

It is clearly left to the operator to decide whether it is better to remove the diseased tonsils and leave areas of infection in the mouth, or remove these areas also and subject the patient to the ill effects that must occur through the loss of these teeth. I would say offhand that I think it is better to clear the mouth of the infected areas before operating for diseased tonsils, or else let the child go altogether, because if we do not do so we are only inviting future trouble, and not really relieving the patient of the trouble for which he is under treatment. Of course, the ideal method would be to maintain the space which teeth have occupied, if any must be removed. This is what we all believe, and what would always be done if an adequate clinic supplied service sufficient to treat such teeth and make them healthy, or, if any are removed, their space to be maintained by suitable appliances until the permanent teeth have erupted. If permanent teeth have to be removed, their space should be maintained until the development of the child's jaw has been completed.

I have enjoyed the essayist's paper very much, and quite agree that it is one of the most scientific and conservative presentations of the subject we have had for a long time.

Dr. F. T. Murlless, Jr., Hartford, Conn. This paper has helped me in forming some conclusions in regard to experiences which I have had, and I feel that I should personally express my thanks to the essayist for his precise presentation of the subject.

I understand that unhygienic conditions of the oral cavity frequently lead to tonsillar infection, also that both periapical abscess of the lower teeth and infections of the tonsils may lead to cervical adenitis. But it is not quite clear to me whether the essayist believes that periapical infection would cause as a secondary lesion an infection of the tonsil of the same side?

Dr. J. A. C. Hoggan, Richmond, Va. In certain conditions of the nasal passages very little adenoid growth is found; but it is often associated with contracted arch. I would like to know if the essayist would remove the adenoids in cases of contracted arch. I would also like to ask if he is familiar with the use of thyroid extract for the reduction of the tonsils.

Dr. B. W. Weinberger, New York. In the essayist's excellent paper it is pleasing to note the conservative treatment of adenoids and tonsils. The point brought out in regard to chorea was particularly interesting. I would

like to ask whether in cases with enlarged tonsils and with adenoids, in which we are attempting to correct malrelation of the jaws, and there is a hesitancy as to an operation, would the essayist advocate the removal of either or both? and which would be likely to play an injurious part in chorea?

Dr. W. H. Pearson, Norfolk, Va. I am glad to meet one more specialist of the nose and throat who does not extirpate all the tonsils in cases that are referred to him. In my experience, whenever a patient is referred to a specialist of the nose and throat for the removal of adenoid tissue, he cannot help but remove the tonsils as well. While I am no judge as to the justification for such a procedure, yet I have seen a great many tonsils removed that had never given any trouble, and prognosticated no trouble so far as I could see. I would like to report a case that came under my observation a few months ago which illustrates that the removal of the tonsils does not always correct the trouble. A physician referred to me for examination a patient who had had a great deal of trouble with his throat. He had consulted two dentists, who pronounced his teeth to be in good condition, but he was still suspicious of his tonsils, and finally had them taken out. A few weeks afterward, while in New York, the patient had a recurrence of the throat trouble. At that time he was referred to me for examination of the mouth, which revealed two suspicious teeth. I found that the patient's tonsillar trouble had been due solely to an abscess from one of those teeth, and the extraction of that tooth corrected the condition entirely.

Dr. Waldron (closing the discussion). Replying to Dr. Ferris regarding gastro-intestinal symptoms, I must confess that the routine examination in this respect is not as complete as is desirable. In the cases referred to us from the children's department, that matter has been looked into carefully, but in our own cases, as you saw today, we only take a dispensary note of some fifteen or twenty lines. This occurs frequently because the physician in charge is too busy or forgets to inquire regarding gastro-intestinal symptoms, but when we miss them in the dispensary, the fourth-year student who handles the case in the ward frequently inquires into the gastro-intestinal history. Examination of the stool is not very often made. We hope when we get a larger staff that every side of the work that has any relation to general medicine will be worked out. That is why our department is at Hopkins; it is not there simply to do throat work, but to be a working adjunct to the medical, children's, and surgical services.

Regarding the teeth and the glands of the neck, it is apparently difficult to prove whether the teeth cause the glands of the neck to enlarge, or whether the teeth infect the tonsils and the tonsils cause the glands to enlarge. Unfortunately, no definite proof in this question has as yet been furnished. Our practice is to remove all foci of infection in those cases which give an indication that the general condition is due to some focus. At Hopkins we meet patients day after day with arthritis, and they are willing to have anything done to arrest the disease. It is necessary to be most thorough and to find every possible focus, sometimes by exploratory work, though there be really but slight indication for it.

Regarding adenoids and the contracted arch in children, we remove adenoids in nearly every case in which we can demonstrate their presence by the mirror or the finger, for the simple reason that the tympanic membrane in nearly every case is affected by the adenoids, and there is trouble in the Eustachian tube. When a child struggles while one is attempting to feel adenoids with the finger, it is sometimes difficult to determine the height of the nasopharynx; an area of adenoid tissue which may be slight will feel like a considerable mass, though at the operation only a small amount will be removed and careful palpation will show that it has been entirely extirpated. The history as

given by the patient will apparently show that even such small amounts may have a marked effect on respiration. The amount of adenoid tissue may be so small as to justify the assumption that it could not cause nasal obstruction, yet within two weeks the child will keep his mouth shut all night and most of the day, and the result is not in doubt. We have not used thyroid extract treatment, having been too busy in other lines, but possibly we may try it later.

In chorea, in the absence of a definite rheumatic history, and of acute or subacute sore throat followed by adenoid symptoms and later by chorea, we depend upon the appearance of the throat, and especially upon the presence of enlarged glands in the neck. If the history is meager as regards tonsillar infection, we depend entirely upon cervical adenitis. If the tonsils are infected, we believe it advisable to take them out; if not, we leave them.

Regarding conditions in the mouth as mentioned by Dr. Kelsey, we do not like to undertake the removal of carious roots, but we feel that it would be an injustice to leave them, according to our present beliefs in this matter. If we had some means of making sure that these children would go to a dental dispensary or to a dental college and have their mouths put into hygienic condition, we would be glad to defer the tonsillectomy until that time, but they will not go. We feel that we should at least establish a fair degree of cleanliness of the mouth and throat, and instruct the children in brushing their teeth, and we hope that by doing so, their general health will be improved.

The association then adjourned.

CORRESPONDENCE.

DENTISTRY IN THE WAR ZONE.

[WITH the following correspondence relating to the New Zealand and Canadian forces, and the picture below from Cairo, we present three other illustrations of field dentistry. See Editorial.]

New Zealand Expeditionary Forces in Egypt.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—I send you the enclosed photograph, which will no doubt be of interest to you; I only regret that the interior is so dark. Our force includes ten dental surgeons who are attached to the various regiments and since August 16, 1914, have done yeoman's work. We have two dentists also with our force in Samoa.

The equipment was supplied by the dental officer himself, and assisted to the extent of between £30 and £50 by the New Zealand government, or rather

FIG. 1.

Field dental hospital, Auckland Infantry Battalion, New Zealand expeditionary force, Cairo.

their Defence department. It was an addition to the force formed in a few days and dispatched with our first force, and requires many improvements, but here we are! and the photo will give you an idea of the scope, comprising all of its kind, with the exception of Canada's, perhaps. Since I had the photo taken for the purpose of forwarding it to my own dental association, the Auckland Branch of the New Zealand Dental Association, I have thought that you

FIG. 2.

Golfers' rendezvous, Hotel Le Touquet, now used as a hospital for the Canadian forces in France. Shows the dental department, in charge of Captain Bentley.

(Photograph by the International News Service.)

branches from extraction to bridge work if necessary, a Seymour casting outfit, a Brophy outfit, in conjunction with a vulcanizer—which, by the way, on the steamer, I ran up with an electrical attachment, since spirits were not allowed—a dry ship!

Everything is compact, and we move with the troops, some going to the firing line, others staying at the base. This, I believe, is the first dental field surgery might be interested. We are exiles from the profession, but the results will be our reward.

Yours faithfully,

B. S. FINN, *Lieut.*,

Auckland Batt., N. Z. Expeditionary Force.

P.S. I have not seen a magazine since I left New Zealand. I practically know nothing of the dental world.

ZEITOUN CAMP, CAIRO, March 7th.

Canadian Expeditionary Forces.

To the Editor of the Dental Cosmos:

Sir,—In a recent issue of the Dental Cosmos appeared an editorial concerning army dental service in the United States, pointing out some particulars in which it was not ideal. I am sending herewith a copy of the new establishment of army dental service in Canada.

Fig. 3.

Tommy Atkins undergoing dental treatment behind the firing line.
(Photograph by the International News Service.)

The Militia department of Canada in this outline has gone farther than any other army organization that I know of. You will note that it has an independent corps, having nothing to do with medicine or any other department except the general officer commanding. Dentistry is placed absolutely, so far as the army is concerned, on the same basis as medicine, having its own officers, its own examinations, its own service throughout, the rank having the same grades as in all other services in the army. The chief dental surgeon over each division will have the rank of lieutenant-colonel. These orders have just been published and I hasten to send them to you because of the widespread interest in the subject:

Canadian Expeditionary Force—Dental Services.

Where practicable, steps are to be taken to have the teeth of all officers, non-commissioned officers, and men of the Expeditionary Force examined and put in proper condition to the extent of all extractions and amalgam fillings before the contingents leave Canada for overseas service, and temporary appointments should be made for this service as occasion requires.

To insure that the men's teeth are kept in proper condition during the period of the

war, the following details are authorized for employment on this service:

One officer in charge of all dental surgeons, to be attached to divisional headquarters, and to be under the direction of the officer commanding the division. This officer will be designated as "chief dental surgeon."

One dental surgeon for each brigade of mounted rifles and artillery (including divisional ammunition column).

Two dental surgeons for each brigade of infantry.

These officers to be attached to the brigade headquarters.

One dental surgeon for each field ambulance, stationary and general hospital, and

One dental surgeon for the base hospital for medical stores, to take charge of stores and equipment.

One dental surgeon for units not otherwise provided for, to be attached to divisional headquarters and under directions of the chief dental surgeon.

Each dental surgeon to be entitled to two men, one to act as orderly and one man as servant or groom.

Fig. 4.

A dentist at work in the German trenches in Poland.
(Photograph by the International News Service.)

Very truly yours,

A. E. Webster.

Toronto, Can., April 14, 1915.

EMETIN AND PYORRHEA ALVEOLARIS.

To the Editor of the Dental Cosmos:

Sir,—It is Dr. Talbot's opinion, and also that of some other dentists, that emetin has no place in the treatment of pyorrhea alveolaris. My clinical experience in the treatment of pyorrhea, to-

gether with a careful microscopic checking-up in twenty-five cases, leads me to take issue with them.

I am sure that if the following technique be followed they will change their views:

If the specimen shows an amœbic infection, inject subcutaneously one-half grain in the deltoid region of either arm, and inject a solution containing alkaloidal emetin, with other ingredients to take care of the associated infection (pyorrhea), into all pockets. Prescribe for the patient a solution of emetin alkaloidal in an alkaline media, to be applied three times a day to all parts of the gums, and a milder solution of the same to be used as a gargle, to control amœbas on the mucous membrane of the throat and tonsils. Prophylaxis should be only superficial at this time, otherwise there is the danger of a deeper infection. General prophylaxis should not be employed until after the seventh day. This is very important.

Repeat the same treatment on the second, third, fourth, and fifth days. On the fifth day a subcutaneous treatment may be necessary; this depends upon the clinical appearance of the gums. After the fifth day it is necessary to see the patient three to four times a week, and carry on persistent pocket medication over a period of from four to six weeks. This is to prevent a reinfection during treatment.

After the mouth is in a healthy condition, a general amœbacide should be used as a safety factor against a new infection. The term new infection is used because there can be no reinfection after the case is cured.

Dr. Talbot in his paper does not mention his experience with emetin; I therefore take for granted that he has not used it. Is he not guilty of what he condemns in others—expressing views not backed up by a proper amount of research work?

Quoting from Dr. Coyle, who uses intravenous injections, and says, "I would suggest the more general adoption of this method, which appears to be a most direct means of reaching the endamœbæ in the circulation, while the injection into the pocket destroys those not reached in the blood stream," I would like to correct him as to this. The amœbæ are not found in the blood circulation.

E. N. Beall.

St. Louis, Mo., May 8, 1915.

FATALITIES UNDER NITROUS OXID AND OXYGEN ANESTHESIA: A CORRECTION.

To the Editor of the Dental Cosmos:

Sir,—Permit me to call your attention to a rather serious mistake which has occurred in the pages of the Dental Cosmos. Dr. R. H. Riethmüller, discussing Dr. W. D. DeLong's paper on "Anesthesia and Its Relation to Operative Dentistry," on page 196 of the issue of the Cosmos for February 1915, quotes a table of the "deaths under gas-oxygen anesthesia which have been reported," which I published in the *New York Medical Journal* of January 24, 1914. By omitting the case numbers of my table, and including the numbers which referred to references at the end of my article, Dr. Riethmüller gives an entirely false and misleading idea of the mortality from nitrous oxid-oxygen anesthesia.

The table of "deaths under gas-oxygen anesthesia which have been reported" was published in the *New York Medical Journal* of the issue stated, and also in Gwathmey's "Anesthesia," page 846. The table reads as follows:

Case 1. Teter: "Shock and primary cardiac failure." *Jn. Am. Med. Assn.*, Aug. 7, 1909, 448.

Case 2. Crile: "Myocarditis, six hours after operation," *Southern Med. Jn.*, Jan. 1910, 29.

Case 3. Lydston: "Anesthetic," *Med. Record*, Nov. 12, 1910, 866.

Case 4. Allen: "Uremia," *Boston Med. and Surg. Jn.*, Oct. 19, 1911, 589.
Case 5. Allen: "No details," *Jn. Am. Med. Assn.*, Feb. 10, 1912, 396.
Case 6. Allen: "No details," *ibid.*
Case 7. Gatch: "Hyperthyroidism," *Jn. Am. Med. Assn.*, Nov. 11, 1911, 1593.
Case 8. Gatch: "Pericardial effusion," *ibid.*
Case 9. Gatch: "Lymphatic diathesis," *ibid.*
Case 10. Olow: "Diseased heart and arteries," *Beitr. klin. Chir.*, Dec. 1911.
Case 11. Boys: "Anesthetic," *Surg. Gynec. and Obstet.*, April 1912, 388.
Case 12. Miller: "Suffocation from inspired vomitus," *Jn. Am. Med. Assn.*, Nov. 23, 1912, 1847.
Case 13. Flagg: "Anesthetic," *N. Y. Jn. Med.*, Nov. 1912.
Case 14. Teter: "Impure gas," *Jn. Am. Med. Assn.*, Nov. 23, 1912, 1849.
Case 15. Teter: "Impure gas," *ibid.*
Case 16. Salzer: "Anesthetic," *Jn. Am. Med. Assn.*, Nov. 23, 1912, 1872.
Case 17. Collins: "Impure gas," *Jn. Am. Med. Assn.*, Nov. 23, 1912, 1862.
Case 18. Buchanan: "Anesthetic," *Jn. Am. Med. Assn.*, Nov. 23, 1912, 1860.

In this table are given the name of the observer who reported each death, the supposed cause of the fatality, and the reference under which the report may be found.

I hope that you will soon find an opportunity to correct the misconception of the safety of gas-oxygen anesthesia which may result from Dr. Riethmüller's misinterpretation of my table of cases. In spite of the eighteen deaths which are known to have occurred under this anesthetic, there is no question in my mind of the accuracy of Dr. Gwathmey's statement that "Nitrous oxid with oxygen is unquestionably the safest anesthetic now known." ("Anesthesia," page 845.)

Yours sincerely,
ALBERT H. MILLER, M.D.
PROVIDENCE, R. I., March 15, 1915.

[IN regard to the above communication, it is only just to point out that if Dr. Miller, in his original publication, had arranged his table of case reports in as clear and unmistakable a form as that in which he now presents it, no mistake would have been possible. In his article as published in the *New York Medical Journal* of January 24, 1914, first, no mention is made anywhere that the total number of fatalities discussed is eighteen; and second, his table is printed in such a misleading manner as to render misunderstanding inevitable, to wit:

OBSERVER.	DEATH ASCRIBED TO—	
1. Teter,	Shock and primary cardiac failure	1
2. Crile,	Myocarditis, six hours after operation	2
3. Lydston,	Anesthetic	3
4. Allen,	Uremia	4
5. Allen,	No details	25
*	* *	
18. Buchanan,	Anesthetic	13

Whereas, if presented, say, as follows:

1. Teter(1),	Shock and primary failure.
*	* *
5. Allen(25),	No details.
*	* *
18. Buchanan(13),	Anesthesia.

—viz, with the bibliographical references following the authors' names instead of the cause of fatality, no mistaking of such bibliographical references for the number of fatalities cited by the authors respectively could occur, as it does when the figures are brought out by "leaders" and ranged in a vertical column at the end.

That Dr. Miller or the publishers of his paper are responsible, by the omission of a distinct reference to the number of cases reported and by carelessness in the typographical arrangement of his table, is further attested by the fact that his paper was practically reprinted in full under "Review of Current Dental Literature," in the DENTAL COSMOS for May 1914, page 628, with several condensations and annotations which show that the reviewer had carefully read and digested the article, but could not, from the misleading way in which Dr. Miller presented his data, read any different meaning into the subject matter than he did in both instances.

That Dr. Riethmüller does not doubt the fact that "Nitrous oxid with oxygen is unquestionably the safest anesthetic now known" plainly appears not only from the whole tenor of his discussion, but especially from his statement, on page 198 of that discussion: "Nitrous oxid and oxygen has no doubt been one of the greatest boons to general surgery, for the reason that it has reduced danger to a minimum if the anesthesia is induced by a skilled operator."—ED. DENTAL COSMOS.]

THE DENTAL COSMOS

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PHILADELPHIA, JUNE 1915.

EDITORIAL DEPARTMENT.

DENTISTRY AT THE FRONT.

IN our March issue we directed attention to the largeness of the opportunity which the military activities of Europe have afforded to the dental profession to demonstrate with convincing clearness the importance of the service which dental and oral surgery can render to those who are actively engaged in their country's defense and who suffer from such injuries and disabilities as are distinctly within the province of dentistry to treat.

The extent of the need of dental service in connection with this great European conflict can scarcely be estimated. Heroic efforts are being made to meet the need for dental service which this war has created, but, extensive as is the service already provided, it is wholly inadequate to meet existing conditions and those which must necessarily hereafter arise.

We present in this issue some illustrations of the character of dental service which to a large extent is being furnished both

in the hospital and in the field of action, as an indication of the adaptation of dental service to military requirements. We are indebted to the International News Service for the three pictorial illustrations Figs. 2, 3, and 4, while Fig. 1 was sent to us by Lieut. B. S. Finn, Auckland battalion, New Zealand expeditionary force, Cairo, whose interesting communication appears at page 701, this issue.

"HAIL PENNSYLVANIA!"

In our issue for November of last year we advanced the proposition that increased educational efficiency upon the part of dental colleges by extension of the length of the curriculum could only be successfully attained and maintained when supported by the favorable sentiment of the dental profession as expressed in the several state laws regulating the practice of dentistry. Briefly stated, the question of advanced dental education is now "up to the profession" rather than "up to the colleges."

In this connection the editorial in question stated: "The standards of professional sentiment with respect to dental education are expressed in the statutes of the several states defining and governing the practice of dentistry therein. No school can successfully maintain a four years' curriculum when the state laws will grant a license after examination to any applicant who has been graduated from a school requiring only a three years' curriculum. Reduced to its lowest terms, the state laws have thus far backed and supported the position of the short-term schools, and left those in the advance guard to shift for themselves. The solution is obvious. The majority of dental educators today recognize the need of a four years' curriculum. When the dental profession wants to advance its standards of professional preparation, it can do so by so amending the state dental laws as to require graduation from a four years' curriculum as a prerequisite for the dental licensing examination."

That a broader and more thorough preparation is needed by the dental practitioner in order to equip him for the enlarged field of service that is now demanding his attention is a self-evident proposition to all who have given serious attention to existing

conditions, and particularly to the unmistakable evidences of the increasing difficulty and complexity of the problems which the later developments in the field of dental activity are urgently pressing for solution, not only in the scientific laboratory but in the domain of everyday practice.

The demand for increased educational preparation to efficiently meet these new and larger problems of dental service has been insistent. The recent graduate immediately becomes a reformer of dental education, demanding that his successors should be compelled to receive what in too many instances he was not willing to voluntarily take in the matter of professional education for his life's work. And collectively he demands that the colleges shall enforce what they are, in the nature of the case, practically unable to enforce unaided by the expressed sentiment of the dental profession crystallized in the statutory enactments regulating the practice of dentistry in the several states. Heretofore the dental profession of no state in the Union has shown the courage of its convictions by demanding that its legislature pass such a law. Within the past few weeks the dental profession of the State of Pennsylvania through the activities of the legislative committee of its State Dental Society has urged the passage of an amendment to its dental law providing that after July 1, 1921, "The State Board of Dental Examiners shall require that candidates for license for the practice of dentistry in the State of Pennsylvania shall have been graduated from a dental school maintaining a course of study consisting of four annual sessions, each in separate academic years." The practical effect of which will be that all dental colleges in Pennsylvania will of necessity be required to begin a four years' course of instruction at the session beginning in the fall of 1917, in order to prepare candidates to meet the licensing requirements in effect in the state in 1921. The amendment will also affect all other institutions any of whose graduates may intend to practice in Pennsylvania.

As one of the earliest and strongest centers of dental education, it is eminently fitting that Pennsylvania should have been the pioneer in taking this forward step. And it is likewise greatly to her credit that despite her extensive educational interests oftentimes conflicting in minor details, she has nevertheless given renewed evidence, in this very practical way, of her loyalty to high

professional standards and of her continued faith in her ancient spirit of devotion to all that makes for progress in our professional life. Pennsylvania by the passage of her new dental law, which has recently received the executive approval, has established a standard and furnished a precedent which should serve both as a guide and a stimulus to the dental profession in the other states to follow her example, and thus place the educational work of our profession upon an advanced and at the same time secure foundation. The following official communication from the University of Alberta announces the legalization of the four years' dental course in the Province of Alberta upon the same basis as that required by the revised statute of Pennsylvania:

The University of Alberta.

REGISTRAR'S OFFICE.

THE Senate of the University of Alberta, which conducts the examinations of candidates for license to practice in Alberta, at its meeting of April 28, 1915, passed the following resolution as to the dental colleges from which candidates will hereafter be accepted for examination:

(1) The four present Canadian dental colleges: Royal College of Dental Surgeons, Toronto; Dental College of McGill University, Montreal; Maritime Dental College and Faculty of Dentistry, Dalhousie University, Halifax; and the School of Dental Surgery, Montreal (affiliated with Laval University).

(2) The seven dental colleges as listed by the Dental Faculties Association of American Universities: University of California College of Dentistry; Harvard University Dental School; University of Iowa College of Dentistry; University of Michigan College of Dental Surgery; University of Minnesota College of Dentistry; School of Dentistry, University of Pennsylvania (Thomas W. Evans Museum and Dental Institute); and the Washington University Dental School.

(3) This list to be added to from time to time by the Senate on report from the Board of Dental Examiners, who shall be a committee appointed by the Senate to investigate and report upon new applications which come before it. Before any such report containing a recommendation to add a college to the list is carried to the Senate, the committee shall have satisfied itself—

(*a*) That the preliminary requirements of the college are at least equivalent to those required for matriculation into the University of Alberta;

(*b*) That the college form an integral part of some recognized university;

(*c*) That after January 1, 1917, a four years' course in dentistry is given by the college in question.

CECIL E. RACE, *Registrar.*

Bibliographical.

Notes on Dental Anatomy and Dental Histology. (A Pocket "Tomes.") By T. W. Widdowson, L.D.S.Eng., late House Surgeon to the Liverpool Dental Hospital. Third Edition, enlarged and revised. London: John Bale, Sons & Danielsson, Ltd. 1915.

By those who consider that the subjects with which it deals should be epitomized and presented in tabloid form for the consumption of the busy student, this volume (which has now passed, after a lapse of four years, into a third edition) should be advanced as a concrete example of the best kind of "cram" book issued for a definite purpose. By those who view the subjects from the standpoints of their value in training the novitiate for a real conception of the gross and minute anatomy of the dental tissues and inducing in him a thoughtful attitude of mind, the work will be regarded as wanting a philosophical and logical basis, and lacking those details which form an essential part of such a study. Epitomized versions of a general anatomy of the human body can never be looked upon as more than mere sketchy outlines of the subject, intended to be read by those about to become candidates for state board and other examinations, for the sole purpose of giving the reader just such an amount of knowledge as will enable him to answer the questions set before him.

If it be admitted that the memorizing of an outline of dental anatomy is good, then this book supplies a want; but if it be acknowledged that an intelligent grasp of a subject—a grasp which educates, which cultivates, which enlarges the mental horizon and paves the way to a scientific and lasting comprehension of the principles and theories of anatomy and pathology and ultimately of surgery—is essential in modern methods of teaching, then the educational importance of such a work becomes greatly discounted, and it may easily be productive of harm and lead to an actual retardation of scientific progress.

We are of those who believe that fundamental studies and principles need careful and daily fostering, and we cannot put down this book without the feeling which we experience when reading other cram books of a similar character, viz, one of disappointment and a sense of hunger for a further and more consequential delivery of a more complete thing. For it is almost certain that the student reader of this volume would not care to peruse those standard works to which the author refers in his preface.

Previous editions having already been reviewed at some length in the Cosmos pages, it remains only to add a few notes on this the latest. The work consists of fifty-three pages more than the 1911 edition, chiefly caused by the inclusion of a larger number of illustrations than that contained. A short additional chapter entitled "Special Characteristics of the Skulls, Bones, and Muscles of the

Jaws in the Animal World" is one of the essential differences. In two and a quarter pages the writer condenses some recent work on this branch of the subject, but the description of the mandibular movements in man is unsatisfactory, and not in accord with the findings of those best qualified to discuss the dynamics of a difficult proposition. In this connection it may be here remarked that the text is not completely up to date, as it does not conform with recent text-books. Further, the more correct *Basle Nomina Anatomica* nomenclature has been ignored. The chart of the ages of the calcification of the deciduous and permanent teeth is incorrect; Low's and Fawcett's investigations on jaw development are omitted; the older theories of dental eruption are still repeated; the drawings inserted in Chapter X are not accurate and do not illustrate; several of the terms applied to certain structures described by the older observers which modern work has proved to be archaic or non-existent, such as "the *membrana preformativa*" (page 53), "the gingival gland or organ" (page 41), and "*crusta petrosa*" (page 28) are retained. The occlusion of the teeth is still spoken of as "articulation."

The writer is no stylist—he has no time, but must hurry on to the next page. Often he is obscure, as witness in writing of the "General Relation of Unerupted Permanents (*sic*) with Erupted Deciduous Teeth": "The canine is far above and out of the arch. There is a slight overlapping of the laterals (*sic*) and centrals (*sic*). The premolars are beneath and sometimes enclosed by the roots of the deciduous molar. After absorption of the alveolus the permanents (*sic*) erupt in a similar manner to the temporaries (*sic*). The permanents stand obliquely when erupted, the temporaries vertically."

The book may be recommended as a short-cut route to an unintelligent, unimaginative, confused, and merely mechanical passing of an examination.

A. H.-S.

Local Anesthesia in Dentistry. By Prof. Dr. Guido Fischer, Director Royal Dental Institute, University of Marburg. Second American from Third German Edition, thoroughly revised with additions, by Richard H. Riethmüller, Ph.D., D.D.S. Illustrated with 115 engravings, mostly colored. Philadelphia and New York: Lea & Febiger. Price $4.00.

This valuable book of 235 pages is divided into three parts. The first part, under the heading of "Modern Local Anesthetics and Their Applications," covers 96 pages and gives a very thorough historical review of the forms of local anesthesia; local *versus* general anesthesia; preliminary measures in local anesthesia; agents for local anesthesia; physical methods of anesthesia; chemical methods of anesthesia; novocain and its solutions; the injecting solution of novocain-suprarenin; the instrumentarium; disinfection of the field of operation, and preparation of the patient for local anesthesia.

The second part of the book, under the heading of "Indications for Local Anesthesia," covers 33 pages, and deals very completely with the following subjects: Dangers of local anesthesia; the operator's responsibility; accidents following novocain injections; indications for local anesthesia; anesthesia in the therapy of inflammation.

The third part is entitled "The Technique of Local Anesthesia," and in 106

pages describes—The anatomical structure of the osseous frame of the maxillæ; the mandibular sulcus and the mandibular foramen: the minute structure of the alveolar process; the nerve supply of the masticatory apparatus; areas of nerve supply of the masticatory apparatus; the minute distribution of nerves in the alveolar process, periosteum, and pulp; the technique of injection; mucous anesthesia by infiltration; pericemental and intra-osseous injection; conductive anesthesia; *résumé* of the clinical value of conductive anesthesia; extent of local anesthesia in the maxillæ; tables for injection-anesthesia, and the conclusion.

This book has become almost a classic, and one that is of the utmost value to the dental student, the dental surgeon, and the oral surgeon. Fischer's book is as important to the dental practitioner as Braun's work on local anesthesia is to the general surgeon. We know of no book that covers the subject of local anesthesia so well for the dental profession, and should predict its being adopted by dental faculties for use as a text-book by their students. The work of the translator reveals his broad knowledge of and keen interest in the subject of local anesthesia. Many practical improvements have been made in this edition by Riethmüller, who has, among other things, devised a new flask for Ringer's solution, has made several important modifications in the jar for syringes, and has also devised a glass tray for needles, hubs, etc.

The book is splendidly illustrated by many photographs, colored engravings, and diagrams. The text is of large, clear type. The printing and binding represent the best of the publisher's art, and are in keeping with the excellent manner in which the subject matter has been handled.

H. S. Dunning.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Deutsche Zahnärztliche Wochenschrift*, Berlin, December 12, 1914.]

THE TREATMENT OF PULPS AND ROOT-CANALS IN DECIDUOUS TEETH. A CLINICAL STUDY. By Dr. H. C. Greve, Munich.

In subjecting this important problem to a thorough discussion, Greve starts out with the patent remark that the principles applied to the treatment of permanent teeth cannot, without modifications, be applied to the deciduous teeth. The structure of the dentin in deciduous teeth is less dense, the roots are shorter, the pulp contains greater proliferations, so that caries and pulp infections assume more severe proportions than in permanent teeth. In cases of acute purulent pericementitis of deciduous teeth extraction is usually indicated, else the resulting fistula will communicate the infection to the pericementum of the succeeding permanent tooth.

Slight hyperemia of the pulp in deciduous teeth, due to the easy permeability of the dentin by bacteria, must be treated by killing the bacteria which have entered the dentinal

tubuli, by means of agents which will not impair the protoplasm of the dentin nor the pulp itself. Hence all deeply penetrating protoplasmic poisons such as formalin are unsuitable, and dilute aqueous solutions of phenol, tricresol, lysol, and chinosol are best indicated for temporary dressings. If a more permanent action is desired, a layer of iodoform incorporated in thinly mixed cement over which an ordinary cement filling is laid is very serviceable, especially in cases where it is impossible to remove all carious dentin, the iodoform exerting a greatly retarding action upon the anaerobes. Silver nitrate in these cases is to be used with judgment, as it is highly escharotic. Its energetic coagulating action, however, and its great bactericidal power render the dentinal layers which it penetrates perfectly sterile. Copper cement and copper amalgam, owing to the formation of copper salts, possess also strongly disinfective power.

Pulps which are infected and inflamed must invariably be extirpated; if suppuration has already set in, the pulp is to be freely exposed and flushed with warm water. As a pulpicide, Greve prefers the application, under an hermetic filling, of an infinitely small quantity of arsenical paste with tannin, the tannin causing contraction of the bloodvessels, hence confining the action of the arsenic. This dressing is removed as soon as the pulpitic pains have ceased, never later than forty-eight hours after application. The pulp is extirpated as far as possible; the removal of small pulp remnants and fibers is greatly facilited by pumping a drop of tricresol-formalin 2 : 1 into the root-canal with a smooth broach, and removing the hardened fibrils with a spring-tempered Donaldson broach with but one barb at the end. If the root has already been absorbed to a great extent, a dressing of tannin and glycerin, equal parts, is applied for twenty-four hours to avoid corrosion of the delicate tissues of the periapical space. Hemorrhage in the course of pulp extirpation is stopped by applying antipyrin or antipyrin and salol, which are non-escharotic hemostatics, and can be applied without risk even in greatly absorbed roots. Those pulp remnants which it has been impossible to remove by mechanical means are sterilized with eugenol and thymol, and the canal is then filled with paraffin inserted with a heated point. Greve is very emphatic about the advantages of paraffin as a root-canal filling in deciduous teeth, as it envelops any tissue remnants and bacteria, and renders them innocuous. The merits of the admixture of an antiseptic to the paraffin he considers as being illusory.

Deciduous teeth in which the pulps have undergone spontaneous necrosis are treated in similar manner to permanent teeth. If the pulp is only partially necrosed, it is freely exposed, cleansed with hot water, and treated in the manner before indicated. Entirely putrid pulps must be fully removed from the root-canals, and every effort must be made to sterilize the apical portion. After gaining free access, and removing mechanically and chemically, with equal parts of sodium dioxid, caustic potash, and phenol, the more easily accessible portions of pulp tissue, Buckley's method of applying a dressing of tricresol-formalin 2:1 can be followed. Unless this preliminary cleansing is done, severe pain if not worse sequelæ must be expected. Instead of tricrescol-formalin, 50 per cent. tricresol, iothion, or iodocresol are most favorably indicated. The appearance after such painstaking treatment of acute or subacute symptoms indicates that the root-apex and periapical tissue have been hopelessly infected, and extraction is the only course left. In such cases the operator has to choose between the risk of causing a malocclusion of the succedaneous teeth, or continued treatment of the infected deciduous tooth until the permanent tooth is ready to erupt.

Among materials for filling the root-canals of deciduous teeth, the writer absolutely rejects cotton, gutta-percha points, or balsam of Peru. He does not seriously object to zinc chlorid cement, or creolin-resin, but gives preference to paraffin, a paste of oil of cloves saturated with thymol and incorporated in zinc oxid, or iodoform-cement after previous impregnation of the canal with an emulsion of glycerin and iodoform—after careful mechanical cleansing and disinfecting treatment, which, after all, is of prime importance for success.

In conclusion, Greve emphasizes the importance of painstaking care in the root-canal treatment of deciduous teeth, and commends it to the special attention of public school clinics and young practitioners.

[*Journal of the American Medical Association*, Chicago, January 2, 1915.]

CYSTIC ODONTOMAS. By G. B. New, Rochester, Minn.

MESOTHELIAL TUMORS OF THE JAWS. By R. H. Ivy, M.D., D.D.S., Philadelphia.

Owing to the marked deformities of the face and jaws that accompany cystic odontomas, New regards early diagnosis and thorough operation as of great importance. He considers his subject under two classes, the simple cysts and the adamantinomas. The simple cysts are again divided into two types: Type A, including the cysts commonly called dental or root cysts, and Type B, those usually called follicular cysts and containing a partially formed tooth. The term follicular cyst used for the second type is misleading in that one takes for granted, without knowing definitely, that this type is developed from the follicle of a tooth. The term dentigerous cysts is used quite loosely, and may refer to either of the foregoing types of simple cysts. New reports twenty-six cases of cystic odontomas from the Mayo clinic, giving an interesting review of the special literature, and valuable suggestions in regard to pathology, diagnosis, and treatment. The paper is illustrated by good radiographs, a gross specimen and cross-section of adamantinoma, and fine histological specimens.

Ivy presents the results of his clinical and histologic studies of a considerable variety of mesoblastic neoplasms of the oral cavity, most of which fall into that group known under the common term "epulis." He classifies epulic tumors as hard or fibrous, and soft or giant-cell. The giant-cell tumors of the jaw-bones fall into the two distinct classes—(*a*) the ordinary so-called giant-cell or myeloid sarcoma, and (*b*) the giant-cell endothelioma, recently described by Whitman. Tumors belonging to type (*a*) have all the clinical characteristics of and may be regarded as benign tumors, and require only local removal of the newgrowth itself, as in the case of other benign growths. Tumors belonging to type (*b*) are more malignant, and should be treated accordingly by more extensive operation. Ivy regrets that the unfortunate application of the term "sarcoma" to the ordinary giant-cell tumors of the jaw has led to much ruthless and unnecessary sacrifice of tissue in a part of the body in which a consideration of cosmetic results is secondary only to the life of the patient. In his opinion, there is no advantage in opening the face or excising half the jaw for the removal of these tumors, when it is perfectly safe simply to shell out the growth from within the mouth without fear of recurrence. In the second or endothelial type, however, a more extensive operation is usually required. The nature of the growth can generally be recognized at operation, but if not, histological examination will indicate whether or not further excision be necessary.

Ivy fortifies his arguments by detailed case histories and beautiful photomicrographs of histologic sections.

[*British Dental Journal*, London, April 1 and 15, 1915.]

THE ETIOLOGY OF DENTAL CARIES. By Professor H. P. Pickerill, Otago, N. Z.

Pickerill gives a wonderfully complete and clear review of the well-nigh innumerable theories which have been advanced in regard to the etiology of dental caries. He thinks that there is at present a growing tendency to regard deficiencies of secretions of certain ductless glands as being concerned in the lowering of the resistance of the tissues to caries, but there is not yet sufficient evidence to show that such deficiencies can be regarded as general causative factors. Other predisposing factors, such as the drinking of soft water, the artificial feeding of infants, pregnancy, and vaccination, seem in a great many instances to cause increasing susceptibility to caries; yet, on the other hand, there is just as reliable evidence that these conditions do not so act. All those factors which lead to malposition and malocclusion, however, may be regarded as etiological factors in caries. Hyperdevelopment of the nervous system also may play a rôle, since it is certain that cerebral stimulation leads to salivary depression, and this, if continuous, certainly means caries, and clinical evidence seems to show caries to be more extensive in individuals whose nervous system is more highly developed than that of individuals of the "animal" type, and exacerbation of caries in certain mouths occurs during periods of nervous stress.

It is obvious from all the evidence gathered that to the etiology of dental caries a large number of factors may or do contribute. There are four chief factors, two attacking—carbohydrates and micro-organisms, and two defensive—the resistance of the enamel surface and the protecting action of the salivary secretion. Each of these may vary more or less, and so the possible permutations and combinations favoring caries are approximately twenty-four. But each of these factors is composed of a large number of contributing factors: The variations in the fermentability of the carbohydrates consumed, the number and type of organisms present, the different possible weaknesses of the enamel surface, and the varying amounts of the chemical constituents of saliva. In addition there are the other systemic factors of internal secretions and hypernervous development. A rough estimate of the possible permutations and combinations of all these factors gives the number of about 3,628,000; that is to say that of this number of cases of caries no two might have exactly the same combination of causes. Health of the tissues is a balance, and one not maintained in every case in exactly the same way. The effect produced in each case, however, will be the same, though the means whereby it is attained may on visual and chemical examination prove to be different in each case.

There is no golden key to be discovered to unlock the riddle of dental caries. Although we may safely generalize to a certain extent, each case must be studied as a distinct clinical entity, and the exact cause or causes of the disturbance of the balance in that particular instance ascertained. No one would be bold enough to assert that the etiologies of all cases of heart disease or of diabetes were identical, though the obvious symptoms might be quite similar. Just as it is necessary for the physician to study each case of any particular disease, to analyze the excretions and examine the blood before a correct idea of the cause can be formed, so it is necessary in our specialty to examine each case minutely, visually, chemically, and bacteriologically, and to submit it to critical judgment before forming an opinion as to the exact cause of the lesions present.

In conclusion, Pickerill urges the immense importance to all states, authorities, practitioners, and patients, of having adequate research work undertaken and facilitated, in order that the etiology, causation, and pathology of dental caries may be placed upon the solid foundation that is demanded by its superstructure, viz, national preventive measures.

[*Western Dental Journal*, Kansas City, November 1914.]

INSPECTION OF DENTAL OFFICES BY THE STATE BOARD OF HEALTH. Editorial.

A very timely subject is here discussed editorially in comment on recent amendments to the sanitary code of the State of Louisiana providing for the inspection of the offices of dentists, physicians, etc., by the state board of health. The amendment states that hereafter all offices, sanatoria, parlors, and other places, whether in charge of a physician, dentist, dermatologist, or other person treating or in any wise attempting to cure any human ailment, shall be subject to inspection by this board. Such offices shall be scored for points and according to the model score card, and when such offices shall fall below fifty points upon such inspection and scoring, the board will cause to be made against the person primarily responsible for the conduct of such office charges for the infraction of this code. The items of inspection and the number of points given as perfect for the different items are as follows: Equipment—location (2), surroundings (2). Arrangement—necessary rooms (1), conveniences (1). Construction—floor (2), walls (1), ceiling (1), light (1), ventilation (1), screens, fans (2). Water—hydrant (3), stationary (1), hot, abundance (5), cool, abundance (5). Drinking-water and glass—in cooler (2), otherwise (1). Instruments (4). Library (4). Furniture (4). Journals—national (2), state (1), for three others (2). Cleanliness—floor (3), furniture (2), walls (2), ceiling (1), doors (1), windows (1), good condition otherwise (2), free from flies (2), free from bad odor (1). Instruments—tables, operating (2), chairs, operating (2), sterilizers (2), sinks and lavatory (3), toilets (3), disposition of old dressings, etc. (3). Personal appearance—of attendant

(2); dentist, physician, or operator—cleanliness of hands and finger-nails (4), personal appearance and breath (6), general health (4).

At first thought this might seem like an uncalled-for imposition, but further reflection reminds us that, if there are offices of dentists and physicians that are unsanitary, they should be made sanitary. Dentists and physicians are eternally preaching and advocating cleanliness and hygiene, and they should put it into practice in person and office. It is one of the first duties that they owe their patients and themselves. They need to take to heart the lesson of personal cleanliness and hygiene which they have been preaching to the layman, or the pupil will outstrip the master in the very things the latter is teaching. No dentist should have fear of an inspection by any board of health should the enforcement of such a code become general; on the other hand, he should at all times keep his office and person in such a presentable condition that it will afford him pleasure to have people come to his office for inspection or otherwise. In these days, when the most modern and sanitary equipment can be obtained, there is no excuse for any dentist to have an office in such a condition that it requires the aid of a board of health to make it a fit place for patients.

The writer then goes on to cite the recent experience of a Detroit business man in a dental office, and the lurid picture of squalor and carelessness drawn gives ample cause for serious reflection. While fortunately such extreme conditions are rarely met with, this editorial comment seems to be a step in the right direction. The conscientious operator will not be embarrassed by legislation regarding sanitary inspection, but the careless practitioner will be forcibly reminded of his plain duties toward himself and his patients, and from hygienic inspection, which is now being so successfully practiced in many other domains, nothing but good can apparently result both to the standing of the profession and the safeguarding of the public.

[*Lancet*, London, April 10, 1915.]

THE EFFECTIVENESS OF TOOTH-WASHES. Editorial.

There are few persons now who have not the conviction that the scientific cleansing of the teeth and gums is very valuable, and the business in antiseptic dentifrices is obviously increasing, judging from the numerous public advertisements which appear in the daily press setting forth the merits of a great number of these preparations. Generally speaking, they are so composed as to render them well adapted for the purpose, and the *Lancet* has submitted a number of them to analytical examination. The choice of antiseptic is commonly confined to carbolic acid, thymol, peppermint, boric acid, benzoic acid, eucalyptus, and other essential oils, distributed in vehicles containing as an agent of attrition non-gritty chalk, and as an alkaline medium, soap. Experiments are usually quoted as to the actual germicidal value of these preparations *in vitro*, but of course it would be more satisfactory to have evidence of their real effect in the mouth, where different conditions must, as a matter of fact, exist. The use of a tooth-wash does not approach the conditions of a laboratory test, though there can be little doubt that a good deal of germicidal work in the mouth is done by the vigorous application of the tooth-brush, and it may be pointed out that the tongue may well be included in the process. To be effective, however, the action of all antiseptics takes time, according to the vitality of the organisms they encounter, and usually the tooth-brushing process does not occupy many seconds. This question of time-exposure is important, but it is very generally overlooked, and consequently the antiseptic treatment of the teeth falls short of that effectiveness which is realized in laboratory experiments. The tooth-washing process should be more prolonged, and the antiseptic wash allowed to remain in contact with the teeth and gums for some minutes instead of seconds before finally washing the mouth clean of the antiseptic with plain water.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

Section I.—*Dental Anatomy, Histology, and Physiology.*

THE ASYMMETRY OF THE INFERIOR MAXILLA AND ITS BEARING ON THE THEORY OF BONWILL'S EQUILATERAL TRIANGLE. By Prof. J. Choquet, Paris.

The theory of Bonwill's equilateral triangle is untenable because it is based on a false principle; this triangle does not exist —owing to the asymmetry of the inferior maxilla. This asymmetry in every individual depends upon either one or all of the following factors: (1) The length of the ascending ramus. (2) The height of the ascending ramus. (3) The transverse diameter of the condyles. (4) The slant of the condyles.

Instead of an equilateral, we find either an isosceles or a scalene triangle. According to the angle from which a mandible is being regarded, the geometrical figure obtained can be entirely varied. In the construction of prosthetic pieces one should above all obtain exact orientation in regard to the articulation of the maxillæ found in the living subject. A great many failures will then be avoided.

Section II.—*Dental Pathology and Bacteriology.*

THE ETIOLOGY AND THERAPEUTICS OF PYORRHEA. By Med. Univ. Dr. Joseph Bodo, Olmütz.

The essayist aims to advance a proof of the untenability of all theories published to the present time, and holds to the principle that any theory which cannot completely throw light on all cases of an illness must be rejected absolutely, and that one must not give different interpretations of the same theory for different cases of an illness. He makes a brief statement as to the inconsistencies that the Karolyi conception has introduced into the dynamic theory; also a statement as to the etiology of pyorrhea, based on his own experience during a period of twelve years, explaining different cases of pyorrhea on the basis of that theory. He bases his therapeutic treatment of pyorrhea on the above etiology, and essays to explain why many dentists can meet with no success in its treatment.

Section III.—*Dental Surgery and Therapeutics.*

A NEW ENGINE HANDPIECE FOR THE TREATMENT OF PYORRHEA ALVEOLARIS. By Dr. Abraham, Berlin.

In treating pyorrhea alveolaris, the mechanical removal of the tartar accumulated between the gingiva and the root of the tooth is of greatest importance. This has been heretofore accomplished with hand instruments, the manipulation of which requires great patience and endurance on the part of the operator as well as of the patient, without guaranteeing success. The handpiece proposed is constructed in such a manner that the inserted instruments are moved back and forth at the rate of sixty to seventy times per minute. These instruments are so shaped that in their up-and-down movement from the cervix of the tooth under the gingiva to the alveolar margin and back, the area under treatment is completely freed of tartar and also highly polished, thereby favorably influencing the reattachment of the gingiva to the cervix of the tooth.

This handpiece can also be advantageously used in separating teeth and filing interstitial spaces and approximal fillings, for preparing tooth abutments for the reception of crowns or bridges, for cleansing teeth, etc., the rotating movement hitherto employed with these instruments being impractical and painful.

ARSENICAL CELLULOSE, A NEW FORM OF INSOLUBLE DEVITALIZING AGENT. By V.-E. Miégeville, Chirurgien-Dentiste, D.E.D.P. et D.F.M.P., Pharmacien-Chimiste de 1ère Classe, Chargé de Cours de Thérapeutique Spéciale à l'École Dentaire de Paris.

Arsenous oxid is wonderfully well suited as a pulp devitalizing agent, but it is very dangerous and productive of numerous accidents, the less serious of which are pain, gingivitis, and pericementitis. The graver sequelæ, which appear less promptly, consist in more or less profound and extensive scars of the cheeks, the tongue, the gingivæ, the circular ligament, and the bone—necrosis. Convinced that not a new drug but a new form was re-

quired, the writer has engaged in researches which resulted in the preparation and application of arsenical cellulose obtained by precipitation, thus preventing all possibility of solution.

TREATMENT OF CARIES OF THE FOURTH DEGREE AND ITS COMPLICATIONS BY IODIN VAPOR. By Henri Grasset, Paris.

Nascent iodin vapor, which is a most powerful antiseptic, renders inestimable services in dental treatment. All infections, especially those due to advanced caries, such as cysts, abscesses, fistulas, yield to nascent iodin vapor treatment, which, if skilfully applied will produce complete cure after two or three applications. The writer presented an iodin fumigating bulb of his own design which is intended to do away with the uncertain and difficult application of antiseptic dressings.

Section VI.—*Orthodontics.*

THE NEED OF ESTABLISHING ORTHODONTICS AS A SPECIALTY IN DENTISTRY. By Prof. Luis Subirana, University of Madrid.

Odontology, by reason of the broad knowledge it requires in its triple therapeutic aspect—pharmacological, surgical, and prosthetic—has acquired the importance of a special branch, some practitioners tending every day more and more to limit their field of practice to it, thus enhancing their skill and knowledge.

But the diploma of dental surgeon still confers the right to cure dental diseases, and to make artificial teeth as well as to correct abnormalities of occlusion—namely, to practice orthodontics on a broad basis—and the time has arrived for all who are interested in the improvement of the profession to recognize the need of separating the teaching of the two sciences, as well as the rights conferred by the title, for if orthodontics was at first a little-known science, it has developed so rapidly as to require absolute independence in teaching and status.

Odontology needs a very important technical and scientific equipment, and orthodontics demands a full knowledge of biological science, and therefore one of the two following plans must be adopted: To eliminate from the teaching all the matter referring to abnormalities of occlusion, and to devote the time to study more perfectly dental pathology and prosthesis; or else it is necessary to lengthen the period of study in order to include the matter of orthodontics, which is now undoubtedly neglected. Nevertheless, we think that it would be better to initiate the steps leading to a definite separation between orthodontics and odontology, both in their teaching and practice.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

CONTRIBUTIONS TO REPLANTATION AND IMPLANTATION, WITH SUBSEQUENT PERMANENT MECHANICAL FIXATION OF THE TEETH TREATED. By Zahnarzt Alfred Cohn, Berlin.

While the majority of writers have regarded the replantation and implantation of teeth as a failure, or any successful operation of this kind as accidental, the mechanical permanent fixation of such teeth has proved to render these operations quite successful. With the exception of one case in which a mechanical error was made, all the teeth treated by the writer have retained their masticating efficiency—in one case for nearly twenty-four years. This procedure is especially valuable in case of loss of an upper incisor in an otherwise healthy denture. The treatment of the teeth to be implanted or replanted is the usual. For mechanical fixation, however, the writer recommends a judicious selection of the method of fixation most suitable for the particular case.

Section IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

PUBLIC DENTAL HYGIENE IN NORWAY. By Dr. O. Smith-Housken, Christiania.

After the Berlin Congress of 1909, the work for the treatment of the teeth of the children in the public common schools received a fresh impetus. On November 1, 1910, the first dental clinic of Norway was opened in Christiania; shortly afterward at Drontheim, subsequently at Bergen, several other towns, and one country municipality, namely, Aker.

All the clinics are municipal and subjected to the school boards. The working expenses everywhere are paid by the municipal

authorities, so that the treatment is free to all children. At all the clinics the beginning is made with the lower forms, going upward in the school, and advancing annually by forms. On June 1, 1911, was founded the Norwegian Association for the Prevention of Dental Diseases. A number of town and country municipal boards are entered as members, also official sick clubs, school boards, etc. The association receives an annual grant from the government. By the aid of the association there has been published, "Dental Caries at the Age of Conscription," by Mr. Arentz, a captain in the sanitary service, in competition for a prize offered by the military medical society; 8512 recruits from different parts of the country were examined by the military doctors. Only 5 per cent. had perfect teeth. On an average 11.4 teeth per individual were found to be damaged at the age of twenty-one. The public sick insurance, a government and municipal institution, since its establishment has rendered free extraction of teeth to its members. In accordance with the resolution of the Storthing—parliament—of the present year, an aid may also, on certain conditions, be granted for the filling of teeth. The government has commenced to appoint dentists at the schools for the abnormal, and at the lunatic asylums.

Section X.—*Dental Education.*

BIBLIOGRAPHIA ET BIBLIOICONOGRAPHIA STOMATOLOGICÆ AB A.D. MDIX AD MCMXIV: with Special Reference to the English Books. By Dr. Andres G. Weber, Havana, Cuba.

In the paper a general description is given of the Bibliography and Biblioiconography on Stomatology—the original manuscript typewritten—the work and original photographs being exhibited at the Congress museum, comprising seventeen volumes, each volume containing about 700 pages, the works mentioned therein dating from the first dental book, "Zene Artzney": Nürenberg, ca 1509 (ten different editions of the Zähn-Artznei Büchlein being mentioned), up to the books printed in the present year. The Bibliography comprises over ten thousand works that treat on our specialty—no general medical works having only parts or chapters on our specialty, nor abstracts or reprints of papers published in periodicals, having been included; only books, theses, or academic inaugural dissertations and pamphlets are mentioned. The number of theses or inaugural dissertations is about four thousand.

A special reference is made of the books in the English language, with the anonymous (Dr. Chamberlen?) pamphlet "An Essay on the Modern Use of Physical Necklaces for Children's Teeth, with a Treatise on the Toothache and Hollow, Rotten Teeth," London, 1727—and of which a special mention is made in the first English book, by Joseph Hurlock, "A Practical Treatise upon Dentition; or, The Breeding of Teeth in Children," London, 1742 (page 36).

The number of English books is over seven hundred. Those printed in the United States number also over seven hundred.

A review is given of the dental periodicals, so as to establish history: *The American Journal of Dental Science:* New York, June 1, 1839, was founded by Eleazar Parmly, Elisha Baker, and Solyman Brown. The first English periodical, *Quarterly Journal of Dental Science*, London, 1843, was edited by James Robinson.

Of the publications of the learned societies, the magnificent file of the Transactions of the Odontological Society of London from 1856, its passage through the Odontological Society of Great Britain, of glorious name, and its amalgamation with the general and special medical and surgical professional associations into the Royal Society of Medicine, are mentioned. Mention is made also of the Transactions of the American Dental Association, now the National Dental Association of the United States.

The publications of the dental and stomatological International Congresses is reviewed, from the First Dental—Paris, 1889—and First Stomatological—Paris, 1907. The bibliography of the publications of the Fédération Dentaire Internationale, proposed by Dr. Haderup of Copenhagen in 1894, and founded by the vote of the Third International Dental Congress, at Paris, 1900, is discussed.

Last and best is the bibliographical review of the fourteen editions and translations of the books of John Hunter—the dental works of Hunter being the book in our specialty which has been translated into most different languages (Latin, Dutch, German, Italian, French) and the book that has had most

editions, fifteen (England, Holland, Germany, Italy, United States, and France).

The bibliography of the existing dental bibliographies, numbering over thirty-two, is given, having been compiled with care; statistical tables of the principal, viz, Ploucquet, 1793 (general works), Crowley, 1885 (general), David, 1890 (French), Sternfeld u. Kellner, 1892 (general), Martinez Sanchez, 1911 (Spanish), Patiño, 1910 (Republic of Colombia), and also of the present work, being included.

The works by John Hunter are—"The Natural History of the Human Teeth." "A Practical Treatise on the Diseases of the Teeth." "Essays and Observations" (posthumous papers). Editions: London, 1771. Dordraci, MDCCLXXIII. Te Dordrecht, MDCCLXXIII. Hagæ, MDCCLXXV. London, 1778 (second edition). London, MDCCLXXVIII (a practical treatise). Leipzig, 1780. Gravenhage, 1780. London, 1803 (third edition). Milano, MDCCCXV. London, 1835–37 (complete works, edited by James Palmer). Philadelphia, 1839 (edited by Thomas Bell). New York, 1839 (edited by Eleazar Parmly). Paris, 1839–43 (complete works). London, MDCCCLXI (posthumous papers, edited by Richard Owen).

PERISCOPE.

Antidotes for Carbolic Acid.—A common antidote for carbolic acid is alcohol, but common cider vinegar is equally good, and often more handy. Externally in full strength it restores the functions of the skin, and removes soreness; internally, diluted one-half or two-thirds, it is to be slowly administered in teacup doses.—*Medical Summary.*

Sterilization of Anesthetic Inhalers.—Particular caution should be exercised in the care of inhalers and breathing-tube, lest they become a means of communicating infection from one patient to another. A few minutes' bath of the inhaler and tubing in a 1: 5000 or 10,000 cyanid of mercury solution, followed by a rinse in water, and used with the inside of the tubing wet, will prevent contamination and will insure a dust- and germ-free gas for the patient.—E. I. McKesson, *Dental Summary.*

Practical Method of Using Oil of Cajuput.—Many practitioners use oil of cajuput or some other essential oil for smoothing off the wax model for an inlay before removing it from the cavity. To prevent excess and spilling the contents of the bottle, a small medicine bottle is filled with absorbent cotton. The oil is poured on this cotton until the latter is slightly saturated. When the pellet of cotton to be used is touched against the oily cotton in the bottle, it will not become over-saturated.—F. S. Dilger, *Dental Review.*

Ink for Writing on Glass.—A good waterproof ink for writing on glass may be made as follows: White ink: 1 part Chinese-white (water-color pigment) or barium sulfate is mixed with three or four parts sodium silicate solution (water-glass). The sodium silicate solution should have the consistence of glycerin. Black ink: 1 part liquid Chinese ink (or Higgin's Eternal Ink, or some similar carbon ink) is mixed with two parts of sodium silicate solution. Either of these inks is applied with an ordinary steel pen. The ink will dry in fifteen minutes and will withstand water. It may be readily removed by scraping with a knife.—*Journ. Amer. Med. Association.*

Sharpening a Scalpel or Lancet.—A quantity of clean beef fat is rendered to common tallow, strained through fine cloth or canton flannel, and while the tallow is in the molten state, No. 1 F carborundum powder is added to make a stiff paste. This paste is spread freely on a smooth strop, which is laid on a table, and the scalpel is drawn back and forth at right angles—not diagonally. This absolutely solves the problem of a keen-edged knife. In cold weather, if the paste is too stiff, a drop or two of olive oil is added to the paste on the strop. A dull instrument can be sharpened in this manner in one-fourth of the time which sharpening with a stone will require.—V. Berry, *Surgery, Gynecology, and Obstetrics.*

Treatment of Lumbago.—An excellent treatment for lumbago, to which the dentist is liable owing to frequent and long-continued bending in his work, is found in salicyl compounds, or a 10 or 20 grain dose of quinin at the onset of the condition is useful. Rochelle salts, one-half to one dram every hour or two until the urine is alkaline and the bowels are freely moved is also valuable. "Walking the lumbago off" may succeed if free perspiration accompanies the exercise. A Turkish bath in the earlier stage is safer and more effective. Later, rest, dry cups locally, deep massage, faradic current, and if salicylates fail, iodin in vegetable protein combination are indicated.—*Medical Summary.*

What Enlightened Patients Do and Do Not Expect from Their Dentist.—The following interesting and amusing letter was received by a dentist from a woman:

"*Dear doctor*, I am in need of some dental work, but before I make an appointment, I would be pleased to have you answer the following questions:

"Do you mix the alloy for fillings in the palm of your hand?

"Do you smoke Turkish cigarettes?

"Do you carry your mouth-mirror in your coat pocket?

"Do you keep a sterilizer and use it?

"Do you wash out cavities with ice-water?

"Do you wash your hands with ice-water, or water that seems like it, and when you put such cold hands on the patients wonder why a cold shiver runs down their backs?

"Do you wash your hands each and every time before you look into a different patient's mouth? Yours truly, ——."

—A. H., *Dental Digest.*

Heating and Ventilation of the Dental Office.—A dental office should contain one or more thermometers, so that the office air may be kept at an even temperature. Not only should a proper temperature be maintained, but an abundance of fresh air supplied. Most dental offices are either kept too hot, or the air is allowed to become impure through lack of sufficient ventilation.

Dentists spend about one-third of their time in the office, and yet give scant consideration to these questions. The careful heating and ventilation of the office has a direct bearing upon the health and efficiency of the operator, and the proper regulation of these conditions is one of the most important duties a dentist's assistant may perform. More service and better service will be rendered by operators who work in fresh air maintained at a correct temperature.—Editorial, *Oral Health.*

Preparing a Tooth for a Porcelain Jacket Crown.—In preparing a tooth for a porcelain jacket crown, the first step consists in shortening the tooth about two millimeters, then with thin carborundum disks the mesial and distal sides are trimmed down to the gingiva, where a slight shoulder or inset is formed. Then the labial or buccal side is stripped of enamel, and the shoulder formed just under the gingiva; the lingual side is next ground and the bite noted. The shoulder should then be trimmed to follow the gingiva around the entire tooth, when it may be finished with fissure burs and small stones. The greatest circumference must be at the shoulder, and care should be taken that there are no undercuts to prevent the accurate withdrawal of the impression. The smallest shoulder that can be trimmed is sufficient, as the strength of a jacket crown does not depend on the bulk of porcelain, but on the close adaptation of the crown. (See also "The All-porcelain Jacket Crown" by R. H. Riethmüller and H. Hough, Dental Cosmos, November 1909, p. 1258.)—H. Avary, *Pacific Dental Gazette.*

False Economy in the Use of Impression Compound.—One of the most popular brands of impression compound on the market is sold in three grades, making it possible to add the lower heat product to material which has been formerly used to renew its usefulness. We note an advertisement as follows: "Don't order 'Seven pounds of compo,' but specify for H—— brand impression composition, which will last you twice as long as seven pounds of ordinary composition and cost you just half the price." Imagine what a lot of respect that dental dealer must have for the profession when he sells to the dentist a white enameled cabinet, an up-to-date antiseptic outfit including a sterilizer, and supplies him with "three pounds of composition that will outlast another." The material is cheap enough, and we think the reason of this practice is not economy, but, as expressed by one practitioner, "the more it is used, the smoother it works." Would you want an impression taken of your own mouth with this "smooth-working," much-used material? Would you use it in your wife's mouth or anyone's for whom you cared? Surely not. A new box and a fresh supply for the family! Why not give the patient an equally fair deal?—Editorial, *Oral Health.*

HINTS, QUERIES, AND COMMENTS.

CAST BACKING FOR PORCELAIN FACING.

Not until casting under high pressure was perfected in dentistry did I succeed in preventing entirely the cracking of porcelain facings in soldering. In all metal work, Ash's repair facings can be employed successfully. The facing is ground to place as usual, and

Fig. 1. Fig. 2. Fig. 4.

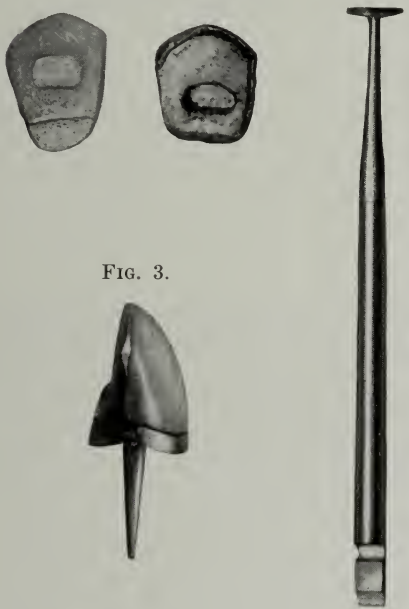


Fig. 3.

the incisal edge ground to a knife edge. (See Fig. 1.) After the back of the facing is oiled, the hole is filled with inlay wax, and a backing built up with the same material, after which the facing is removed, and the wax pattern is invested and cast by the Taggart method. (See Fig. 2.) After thoroughly removing the investment compound, the cast backing is boiled in acid and soldered to the cap protecting the root, and the facing is cemented to the backing. (See Fig. 3.) If no Ash facing is at hand, one can easily be made by cutting off the pins from an S. S. White or Justi facing. In place of the pins, a depression is cut with a little stone, and finished with a copper disk. This copper disk (Fig. 4) can be made in a few minutes by punching out a disk of copper of the desired size and soldering it with silver solder to a fine bur, the head of which is broken off.

G. E. Klicka, D.D.S.

Pilsen, Austria.

METHOD OF MAKING A STEELE'S INTERCHANGEABLE TOOTH OF ANY PLATINUM PIN TOOTH IN WHICH THE PINS ARE SET CROSSWISE.

A tooth of suitable shade and size is selected. Should the exact size be not available, it is preferable to select one slightly larger than desired.

If the tooth selected be one for vulcanite work, having a pin guard, the pins are cut off flush with the tooth; the bite and shut of the tooth are ground flat in imitation of a flat-back tooth for metal plate work. If a flat-back tooth be selected, the pins are cut off flush with the tooth.

With a narrow-edged carborundum stone in the engine, a slot is cut in the back of the tooth, midway between the pins, from the gingival margin toward the incisal end. The width of the slot should be slightly greater than the diameter of the tubular post of the backing. The depth and length of the slot is determined by trying the tooth on the backing, until it lies in place in the same relation to the post of the backing as do Steele's interchangeable teeth.

The slot is countersunk on both sides and at the incisal end to a depth of about 0.02 inch—which is the thickness of 24-gage plate

—and to the width of the outer edges of the pins, the pins being ground down with the porcelain in the countersunk area.

After oiling both the tooth and the backing, some softened inlay wax is placed in the tooth, and it is pressed to place on the backing. When the wax is hard, both the tooth and the wax are slid from the backing, and the wax is invested and cast in gold.

The piece of cast gold is soldered to the exposed ends of the platinum pins in the tooth. This may be done, without investing, in a porcelain furnace. When cool, the gold backing is polished flat.

Fig. 1.

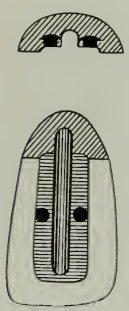
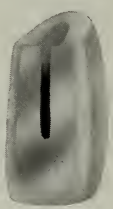


Fig. 2.



The tooth may then be used in the same manner as a Steele's interchangeable tooth. (See Fig. 1.)

Except when it is desirable to use gum teeth, or an especially carved or shaded tooth, this method will never be used, if Steele's facings are available: but there are circumstances under which the dentist may be willing to do considerable extra work in order to make a permanent repair more quickly than a new facing can be procured, without marring the original work in the mouth.

If a spare Steele's backing is at hand, the patient may be dismissed after the proper tooth is selected, and the entire work may be completed in the laboratory, until the actual setting of the facing takes place.

The practical application of the method described even in such a small tooth as a lateral is shown in Fig. 2.

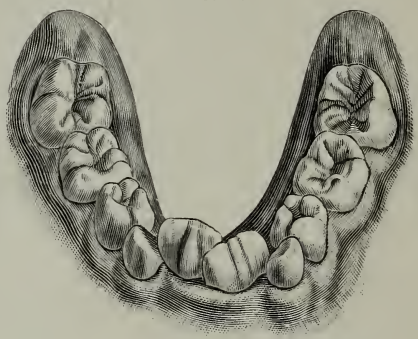
C. Henry Hertz, D.D.S.

Penang, S. S.

A REMARKABLE CASE OF GEMINATION.

In the September 1890 issue of the Dental Cosmos, page 750, the writer published a brief description of "Geminated Lower

Fig. 1.



Teeth," as shown in Fig. 1. The present case (see Fig. 2) is, however, still more remarkable, as it appears to present a supernumerary tooth joined to each central incisor. The individual in whom this anomaly was ob-

Fig. 2.

served was a boy of nine years of age. The plaster impression was obtained under rather unfavorable conditions, in the country, but shows the condition fairly well.

A. W. Sweeney.

Baltimore, Md.

AN ANSWER TO DR. PENSAK'S QUERY FOR THE PROSTHETIST.

[See March Cosmos, page 355.]

The neatest and least conspicuous result will be attained by the insertion of three centrals and two laterals.

L. Shepherd Wilson, M.D., D.D.S.
Elmhurst, N. Y.

INFANTILE SCORBUTUS COMPLICATING ERUPTION OF DECIDUOUS TEETH, AND TREATMENT.

At the age of six months, my son erupted the upper central incisors normally. Soon after, a reddish purple and engorged ring of gum tissue appeared around these teeth. The laterals did not erupt until the tenth month. During this period the inflammation continued, and the engorged tissue at times almost covered the entire half-erupted crowns. At times the tissue would break, with considerable bleeding, followed with a subsiding of the inflammation to a considerable degree, only to be followed by another cycle. The labial frenum was attached to the alveolar ridge between the centrals, causing a separation of these teeth of about two lines in width. The boy was a bottle-fed baby and seemed to be in perfect health, being normal in weight, etc.

Correspondence with some of the leading men in the dental profession brought out the suggestion by only one, viz, Dr. E. C. Kirk of Philadelphia, that the condition might be caused by a mild form of infantile scorbutus, and that orange juice be given. This was done, with an almost immediate return to normal of the parts involved.

H. P. Emeis, D.D.S.
San Diego, Cal.

HYDROGEN DIOXID IN FINISHING CEMENT FILLINGS AND CEMENTING INLAYS.

To obtain a particularly smooth surface in a cement filling, or to remove cement from any surface—that of an inlay, for example—without jarring the inlay, while the cement is still unset a pellet of cotton is moistened in hydrogen dioxid, and the filling is finished off, or the inlay cleaned off. Remembering that hydrogen dioxid is effective because it *attacks* the cement, care should be taken to avoid destruction, and the dioxid washed off after use.

Harriette Hart, D.D.S.
New York City.

OBITUARY.

"IN MEMORIAM" RESOLUTIONS.

Dr. Louis Jack.

At a recent meeting of the American Academy of Dental Science, Boston, of which Dr. Louis Jack was an associate fellow, the following preamble and resolution of regret were unanimously adopted:

Dr. Louis Jack, a distinguished associate fellow of the American Academy of Dental Science, died at his home at Moyland, Pa., near Philadelphia, on December 9, 1914, in his eighty-third year. He was born at Germantown, a suburb of Philadelphia, March 26, 1832, and enjoyed a practice of fifty-four unbroken years in his chosen profession.

At an early age he was taken by his parents to Beaver county, Pa., where he received his preliminary education at the Bridgewater Academy. At the age of twenty he returned to Philadelphia to look around to see what he might find to do, and soon decided to take up the study of dentistry. He first became associated with Dr. Wm. R. White, in whose laboratory he was employed, and afterward with Dr. C. C. Williams. It was at this time that he learned that the Philadelphia College of Dental Surgery, the first school in Pennsylvania to teach dentistry, was about to open its doors to students, and he was the

first matriculate to register, September 2, 1852. He was graduated in a class of nineteen on February 28, 1854.

Soon after being graduated, he opened his first office in the house of Dr. Robert Arthur, and was closely associated with him. It was during the winter of 1855 that the cohesive property of gold foil was first brought to light in Dr. Arthur's laboratory.

He was instructor at the college for several years after his graduation, and in 1857 moved his office to Germantown, within a stone's throw of the spot where he was born, and in 1864 he returned to the city proper, where he remained until his retirement in 1908.

For several years during the early seventies he devoted much of his time after office hours to the construction of an electric mallet. This invention he gave to the dental profession, and for this act the Odontographic Society of Pennsylvania presented to him a testimonial of thanks for his "professional liberality and loyalty to professional ethics."

He early recognized the importance of a good and lasting school for the teaching of dentistry in this country, was one of the first to urge the institution of such a department at the University of Pennsylvania, and was instrumental in the formation in 1877 of that department, in which he was an occasional lecturer.

He was the "father" member of the Philadelphia Dental Club, having been a member covering a period of forty-two years, from its origin in 1872 until the time of his death.

He was interested in the development of the *International Dental Journal*, and was for a time president of the corporation which owned and published it. He was a member of the National Dental Association, the American Academy of Dental Science, the Odontographic Society of Pennsylvania, the Odontological Society of Pennsylvania, the Pennsylvania State Dental Society, the Academy of Stomatology of Philadelphia, and the Philadelphia Dental Club.

Dr. Jack was the last survivor of the class of 1854 of the old Philadelphia College of Dental Surgery. He was a classmate of Prof. James Truman, who died in Philadelphia only a month before him.

Dr. Jack was a man of unusual ability, a gentleman of the highest character, dignified and refined. He was a sturdy advocate of all that was best in his profession. The hand of the artist showed itself unmistakably in everything he did. His skill as an operator gave to him an international reputation. The Academy honors the memory of Dr. Louis Jack, and sorrowfully adds one more illustrious name to its memorial records.

He did much to make our profession what it is today, one of the great ameliorating agencies of modern civilization. He was not untimely taken. His life was prolonged many years, was happy and famous. We look upon his distinguished attainments with feelings of gratitude and appreciation. No man ever exercised a more genial personal influence over his friends, and those who knew him best realized the exalted character of the man, and loved him; therefore be it

RESOLVED, That in the death of Dr. Louis Jack the Academy mourns one of its distinguished fellows, who has ever been an honor to his profession, and we deem it fitting to make a record of our sense of sorrow at his loss.

ROBERT R. ANDREWS,
CHARLES A. BRACKETT,
EUGENE H. SMITH,
Committee.

Society Notes and Announcements.

NOTICES should reach the Office of the DENTAL COSMOS not later than the 10th or 11th of the month preceding that of publication.—ED. COSMOS.

DENTAL SOCIETY MEETINGS:

June, July, and August.

JUNE.

Colorado State Dental Association. Manitou. Three days: June 17th to 19th.

Florida State Dental Society. Passagrille. Three days: June 9th to 11th.

Kentucky State Dental Association. Ashland. Three days: June 8th to 10th.

Louisiana State Dental Society. New Orleans. Three days: June 3d to 5th.

Maine Dental Society. Portland. Three days: June 28th to 30th.

Minnesota State Dental Association. Minneapolis. Two days: June 11th and 12th.

Missouri State Dental Association. Jefferson City. Three days: June 10th to 12th.

New Hampshire Dental Society. Weirs. Three days: June 22d to 24th.

North Carolina Dental Society. Wrightsville Beach. Three days: June 23d to 25th.

Pennsylvania State Dental Society. Reading. Three days: June 22d to 24th.

Tennessee State Dental Association. Sewanee. Three days: June 24th to 26th.

JULY.

New Jersey State Dental Society. Asbury Park. Four days: July 21st to 24th.

AUGUST.

American Society of Orthodontists. San Francisco. August 30th.

International Dental Congress and National Dental Association. San Francisco, Cal. August 30th to September 9th.

Examiners' Meetings.

Alabama Board of Examiners. Birmingham. June 14th.

Arkansas Board of Examiners. Little Rock. June 21st to 23d.

California Board of Examiners. San Francisco, June 4th; Los Angeles, June 18th.

Connecticut Dental Commissioners. Hartford. June 17th to 19th.

District of Columbia Board of Examiners. Washington. June 7th to 10th.

Florida Board of Examiners. Tampa. June 4th to 8th.

Idaho Board of Examiners. Boise. July 6th.

Illinois Board of Examiners. Chicago. June 10th.

Indiana Board of Examiners. Indianapolis. June 14th to 19th.

Iowa Board of Examiners. Iowa City. June 7th.

Maine Board of Examiners. Augusta. July 1st to 3d.

Massachusetts Board of Registration. Boston. June 2d to 4th.

Michigan Board of Examiners. Ann Arbor. June 14th to 19th.

Mississippi Board of Examiners. Jackson. June 15th.

Montana Board of Examiners. Helena. July 12th to 15th.

Nebraska Board of Examiners. Lincoln. June 9th.

Nevada Board of Examiners. Carson City. June 18th.

New Hampshire Board of Registration. Manchester. June 14th to 16th.

New Jersey Board of Registration. Trenton. June 28th to 30th.

North Carolina Board of Examiners. Wrightsville Beach. June 21st.

Oklahoma Board of Examiners. Oklahoma City. June 14th.

Pennsylvania Board of Examiners. Philadelphia and Pittsburgh. June 9th to 12th.

Rhode Island Board of Registration. Providence. June 23d to 25th.

South Carolina Board of Examiners. Columbia. June 15th.

South Dakota Board of Examiners. Sioux Falls. June 13th to 16th.

Tennessee Board of Examiners. Nashville. June 7th to 11th.

Texas Board of Examiners. Dallas. June 21st.

Vermont Board of Examiners. Montpelier. June 28th to 30th.

Virginia Board of Examiners. Richmond. June 8th.

West Virginia Board of Examiners. Charleston. June 9th.

Wisconsin Board of Examiners. Milwaukee. June 21st.

Wyoming Board of Examiners. Chicago. June 29th and 30th and July 1st.

AMERICAN SOCIETY OF ORTHODONTISTS.

There will be a meeting of the American Society of Orthodontists held on Monday, August 30, 1915, at 9.30 a.m., at San Francisco, Cal., in the room assigned to the Orthodontia Section of the Panama-Pacific Dental Congress. It is respectfully requested that as many members of the American Society of Orthodontists as possible be present.

F. C. Kemple, *President*,
F. M. Casto, *Sec'y-Treas.*

UTAH STATE DENTAL SOCIETY.

Want to Entertain Visiting Dentists.

The Utah State Dental Society desire to entertain all dentists who visit Salt Lake or Ogden. This we shall be very glad to do, if we are notified when they, individually or collectively, will arrive in either of these towns.

Earl G. Van Law,
Chairman Entertainment Committee.
913 Walker Bk. Bldg., Salt Lake City, Utah.

NORTHEASTERN DENTAL ASSOCIATION.

The Northeastern Dental Association will hold their twenty-first annual meeting in Springfield, Mass., on October 13, 14, and 15, 1915.

Alvin A. Hunt, *Sec'y*,
Hartford, Conn.

DENTAL RED CROSS FUND.

At the meeting of the American Institute of Dental Teachers held at Ann Arbor, Michigan, on January 26th, it was decided to take steps that should result in the raising of a fund to be used through the Red Cross Society in giving relief and aid to the soldiers in Europe who are suffering from oral and dental injuries. The president was instructed to appoint a committee to take charge of this matter. President F. W. Gethro, under this instruction, appointed the following Executive and General Committees:

Executive Committee.

C. R. E. Koch, *Chairman;* John F. Biddle, *Sec'y;* Henry W. Morgan, E. A. Johnson, Ellison Hillyer.

General Committee.

E. C. Kirk, Philadelphia.
J. H. Kennerly, St. Louis.
H. C. Miller, Portland, Ore.
D. M. Gallie, Chicago.
John F. Biddle, Pittsburgh.
E. T. Darby, Philadelphia.
Alfred Owre, Minneapolis.
B. Holly Smith, Baltimore.
E. A. Johnson, Boston.
Frank Holland, Atlanta.
D. M. Cattell, Memphis.
Frederick R. Henshaw, Indianapolis.
S. W. Bowles, Washington.
E. H. Smith, Boston.
A. H. Hipple, Omaha.
Ellison Hillyer, New York.
Truman W. Brophy, Chicago.
D. H. Squire, Buffalo.
H. E. Friesell, Pittsburgh.
Henry W. Morgan, Nashville.
I. N. Broomell, Philadelphia.
Wallace Wood, New Orleans.
Frank T. Breene, Iowa City.
H. L. Banzhaf, Milwaukee.
J. G. Sharp, San Francisco.
G. V. Black, Chicago.
W. T. Chambers, Denver.
H. M. Semans, Columbus.
J. D. Patterson, Kansas City.
N. S. Hoff, Ann Arbor.
C. N. Johnson, Chicago.
H. L. Wheeler, New York.
L. E. Ford, Los Angeles.
C. R. E. Koch, Chicago.
H. B. Tileston, Louisville.

The Executive Committee is preparing contribution certificate booklets, each containing twenty certificates or coupons certifying that the holder thereof has contributed twenty-five cents to this fund. This certificate will be neatly lithographed, something like national currency. It will be printed in lilac ink—the color of the dental profession—and bear upon its face the red Geneva cross.

It is hoped that the dental schools, dental students, and dental societies, as well as the profession at large, will become sufficiently interested in this propaganda to secure a large enough fund through these small contributions to secure real relief for the class of war sufferers for which it is designed. That it may aid in the establishment of several special hospitals or wards devoted to dental and oral surgical injuries, within the belligerent zone of Europe, is the ultimate purpose of this movement.

Make applications for booklets to any member of Executive or General Committees.

LOUISIANA STATE DENTAL SOCIETY.

THE next Louisiana State Dental Society meeting will be held in New Orleans, La., June 3, 4, and 5, 1915, at the Grunewald Hotel.

P. W. TROWBRIDGE, *Sec'y.*

FLORIDA STATE DENTAL SOCIETY.

THE Florida State Dental Society will hold its annual meeting on June 9, 10, and 11, 1915, at Passagrille, Fla.

All ethical dentists are cordially invited.

ALICE P. BUTLER, *Corr. Sec'y,*
Gainesville, Fla.

KENTUCKY STATE DENTAL ASSOCIATION.

THE Kentucky State Dental Association will hold its forty-sixth annual meeting at Ashland, June 8, 9, and 10, 1915. The program will be carried out on the progressive clinic order. All reputable dentists are invited to atend.

CHAS. R. SHACKLETTE, *Sec'y,*
Louisville, Ky.

PENNSYLVANIA STATE DENTAL SOCIETY.

THE forty-seventh annual meeting of the Pennsylvania State Dental Society will be held in Reading, Pa., June 22 to 24, 1915.

LUTHER M. WEAVER, *Sec'y,*
Philadelphia, Pa.

MINNESOTA STATE DENTAL ASSOCIATION.

THE thirty-second annual convention of the Minnesota State Dental Association will be held in Minneapolis, Minn., June 11 and 12, 1915.

MAX E. ERNST, *Sec'y,*
St. Paul, Minn.

MAINE DENTAL SOCIETY.

THE fiftieth anniversary meeting of the Maine Dental Society will be held in the Lafayette Hotel, Portland, Me., on June 28, 29, and 30, 1915.

I. E. PENDLETON, *Sec'y,*
Lewiston, Me.

NORTH CAROLINA DENTAL SOCIETY.

THE next annual meeting of the North Carolina Dental Society will be held at Wrightsville Beach, June 23, 24, and 25, 1915.

R. M. SQUIRES, *Sec'y,*
Wake Forest, N. C.

NEW HAMPSHIRE DENTAL SOCIETY.

THE next meeting of the New Hampshire Dental Society will be held at the New Hotel Weirs, Weirs, N. H., June 22, 23, and 24, 1915.

C. S. COPELAND, *President,*
L. I. MOULTON, *Sec'y.*

TENNESSEE STATE DENTAL ASSOCIATION.

THE forty-eighth annual meeting of the Tennessee State Dental Association will be held in Sewanee, Tenn., June 24, 25, and 26, 1915.

C. O. RHEA, *Sec'y,*
Nashville, Tenn.

MISSOURI STATE DENTAL ASSOCIATION.

THE Golden Jubilee meeting of the Missouri State Dental Association, to be held at Jefferson City, Mo., takes place June 10, 11, and 12, 1915. Elaborate preparations have been made to celebrate the semi-centennial meeting of this association on an elaborate scale. For information address

S. C. A. RUBEY, *Sec'y*,
1017 New York Life Bldg., Kansas City, Mo.

COLORADO STATE DENTAL ASSOCIATION.

THE annual meeting of the Colorado State Dental Association will convene at Manitou, Colo., June 17, 18, and 19, 1915. A cordial invitation is extended to all ethical practitioners to be with us at that time. Exhibitors should communicate with Dr. E. J. Kelley, 700 Exchange National Bank, Colorado Springs.

EARL W. SPENCER, *Sec'y*,
120 Pope Block, Pueblo, Colo.

NEW JERSEY STATE DENTAL SOCIETY.

THE forty-fifth annual convention of the New Jersey State Dental Society will be held at Asbury Park on July 21, 22, 23, and 24, 1915.

The headquarters will be located at the Coleman House. The ballroom will be used for all meetings of the society. The glass-inclosed Casino over the ocean, just across the ocean drive from the Coleman House, has been secured for the exhibits and clinics. With over 2000 more square feet of floor-space than the pavilion used last year there should be adequate room.

Dr. Chauncey F. Egel of Westfield, N. J., is chairman of the Exhibit Committee, and reports that applications are already being made for space. Dr. W. W. Hodges of Perth Amboy is arranging for an attractive list of clinics. The Essay Committee, under the chairmanship of Dr. James I. Woolverton of Trenton, will have three essayists of prominence to present.

A cordial invitation to attend is extended to all ethical practitioners.

JOHN C. FORSYTH, *Sec'y*,
430 E. State st., Trenton, N. J.

TENNESSEE BOARD OF EXAMINERS.

THE Tennessee Board of Dental Examiners will meet in Nashville, Tenn., June 7, 8, 9, 10, and 11, 1915.

Examinations will be both theoretical and practical. The theoretical examinations will be in writing. Applicants must furnish instruments and material for any work required by the board, and must present to the board a diploma that he or she has been graduated in dentistry at some college recognized by the National Association of Dental faculties. All persons desiring to take examination must file their applications with the secretary at least five days before the meeting of the board. A fee of $15 is charged, and must accompany the application. Application blanks can be obtained by addressing

W. G. HUTCHISON, *Sec'y*,
Eve Bldg., Nashville, Tenn.

ALABAMA BOARD OF EXAMINERS.

THE Board of Dental Examiners of Alabama will hold examination at Birmingham, Ala., in the Birmingham College, commencing at 9 A.M., on June 14, 1915.

Theoretical examinations in writing; they embrace subjects generally taught in dental colleges, including bacteriology, ethics, and jurisprudence. Practical work consists of one amalgam, one gold and one silicate filling in the mouth, cavities to be selected by the board; operator is graded upon cavity preparation, insertion of filling, and final finish of same. Cast gold inlay either in mouth or extracted tooth; mesio-approximo-occlusal cavity in molar; bridge of four teeth, shell crown on upper first molar; Richmond or Morrison crown on canine, two bicuspids dummies, using pin facings with gold cusps; Steele's—or other—interchangeable facings, with gold cusps; Steele's—or other—posteriors boxed. Applicants are allowed to prepare upper and lower models of mouth on articulator; also to complete shell crown for molar, to complete cap and pin for Richmond. Examination fee $10.

W. J. REYNOLDS, *Sec'y*,
Parrish Bld'g, Selma, Ala.

IOWA BOARD OF EXAMINERS.

THE next meeting of the Iowa State Board of Dental Examiners for the examination of candidates for licenses will be held at Iowa City, Iowa, commencing Monday, June 7th, at 9 A.M. For application blanks and so forth, address

J. A. WEST, *Sec'y*,
417 Utica Bldg., Des Moines, Iowa.

INDIANA BOARD OF EXAMINERS.

THE next meeting of the Indiana State Board of Dental Examiners will be held at the State-house, Indianapolis, commencing June 14, 1915, and continuing six days.

For application blanks and full particulars address

FRED J. PROW, *Sec'y*,
Bloomington, Ind.

FLORIDA BOARD OF EXAMINERS.

THE Florida State Board of Dental Examiners will meet in Tampa, June 4, 5, 7, and 8, 1915, for the purpose of examining applicants who wish to practice in Florida.

All applicants must exhibit diploma from some reputable dental school, and have recent photograph of self. Fee of $25 must accompany application. Florida does not interchange license with any state.

Any further information may be had from

W. C. MASON, *Sec'y*,
Tampa, Fla.

MISSISSIPPI BOARD OF EXAMINERS.

THE Mississippi State Board of Dental Examiners will hold its annual examination, beginning on June 15, 1915, in the senate chamber of the state Capitol.

All applicants will be required to be graduates of a reputable dental college or school of dental surgery. Applications must be filed with the secretary of the board ten days prior to entering upon the examination, with fee of $10 attached.

For further information, adress

REUEL MAY, *Sec'y*,
Jackson, Mass.

VIRGINIA BOARD OF EXAMINERS.

THE regular annual meeting of the Virginia State Board of Dental Examiners, for the examination of applicants to practice dentistry in the State of Virginia, will be held in the city of Richmond, Va., June 8, 1915, commencing at 9 A.M.

For further particulars apply to

J. P. STIFF, *Sec'y*, Fredericksburg, Va.

DISTRICT OF COLUMBIA BOARD OF EXAMINERS.

THE next examination of applicants for license to practice will be held at Georgetown University, June 7, 8, 9, and 10, 1915. Applications should be in the hands of the secretary two weeks before the date of examination. Fee $10.

STARR PARSONS, *Sec'y*,
1309 "L" st., N. W., Washington, D. C.

ILLINOIS BOARD OF EXAMINERS.

THE next annual meeting of the Illinois State Board of Dental Examiners will be held at the Northwestern University Dental School, Chicago, Ill., commencing June 10, 1915.

For application blanks, rules, and regulations, etc., apply to

O. H. SEIFERT, *Sec'y*,
Springfield, Ill.

PENNSYLVANIA BOARD OF EXAMINERS.

THE next regular examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, Philadelphia, and in the College of Pharmacy Building, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, June 9, 10, 11, and 12, 1915. The examination in practical work will be held on Wednesday, June 9, at 1 P.M. at the Evans Dental Institute in Philadelphia, and at the University of Pittsburgh Dental College in Pittsburgh.

Application papers can be secured from the department of Public Instruction, Harrisburg. Any further information can be secured from

ALEXANDER H. REYNOLDS, *Sec'y*,
4630 Chester ave., Philadelphia.

NEBRASKA BOARD OF EXAMINERS.

The next meeting of the Nebraska Board of Dental Examiners will be held at Lincoln, Nebr., beginning at 9 A.M. Wednesday, June 9, 1915.

All applications must be in the hands of the secretary not later than June 1, 1915. Application blanks may be obtained by addressing

J. H. Wallace, *Sec'y*,
212 Brown Block, Omaha.

CALIFORNIA BOARD OF EXAMINERS.

The next meeting of the Board of Dental Examiners of California for the purpose of examining applicants for a license to practice dentistry will be held in the city of San Francisco, beginning on June 4, 1915. This examination will be followed by one to be held in the city of Los Angeles, beginning on June 18, 1915. For further particulars, address

C. A. Herrick, *Sec'y*,
133 Geary st., San Francisco, Cal.

WISCONSIN BOARD OF EXAMINERS.

The Wisconsin State Board of Dental Examiners will convene in Milwaukee, at Marquette University, on June 21, 1915, at 2 P.M., for examination of applicants.

High-school diploma, application, and $25 fee to be filed with the secretary ten days prior to above date. Dental diploma to be presented in advance of the examination.

Junior dental students presenting a clear card for two years' unconditional work from a reputable dental college and filing a high-school diploma, or its full equivalent, will be permitted to participate in the theory examination in the following six major subjects: Anatomy, physiology, histology, chemistry, bacteriology, materia medica. Satisfactory grades made in these subjects will be credited at subsequent examinations.

Special application blanks for this examination and $10 fee, together with high-school credits, to be filed ten days in advance.

S. H. Chase, *President*,
W. T. Hardy, *Sec'y*,
1404 Majestic Bldg., Milwaukee, Wis.

RHODE ISLAND BOARD OF REGISTRATION.

A regular meeting of the Rhode Island State Board of Dental Examiners will be held at the State-house, Providence, R. I., June 23, 24, and 25, 1915. For further information apply to

Wm. B. Rogers, *Sec'y*,
171 Westminster st., Providence, R. I.

MASSACHUSETTS BOARD OF REGISTRATION.

A meeting of the Massachusetts Board of Registration in Dentistry, for the examination of candidates, will be held in Boston, Mass., June 2, 3, and 4, 1915.

Candidates who have applied for examination will report to the secretary, Wednesday the 2d at 10 A.M., at Tufts College Dental Infirmary, Huntington ave., prepared with patient, rubber dam, gold, plastic filling materials and instruments, to demonstrate their skill in operative dentistry. The board in every instance selects the cavity to be filled. Partially prepared cavities never accepted.

The thoretic examination—written—will include operative dentistry, prosthetic dentistry, crown and bridge work, orthodontia, anatomy, histology, surgery, pathology, materia medica, therapeutics, physiology, bacteriology, anesthesia, chemistry and metallurgy, and will be held at civil service room, No. 15 State-house, commencing Thursday the 3d at 10 A.M. Candidates are required to bring pens.

All applications, together with the fee of twenty dollars, if first examination, must be filed with the secretary of the board ten days before the date of examination, as no application for this meeting will be received after that date.

Candidates for second and subsequent examinations will be required to fill out an application blank (Form 2) and forward to the secretary as above.

Every candidate for examination must be twenty-one years of age. Application blanks may be obtained from the secretary. Applications must be made out in candidate's own handwriting. Temporary licenses are never granted. The fee for third and subsequent examinations is $5.

G. E. Mitchell, *Sec'y*,
Haverhill, Mass.

WEST VIRGINIA BOARD OF EXAMINERS.

THE next regular meeting of the West Virginia State Board of Dental Examiners for the examination of applicants who wish to begin the practice of dentistry in the State of West Virginia will be held in the city of Charleston, beginning at 9 o'clock A.M., on June 9, 1915. For further information and application blanks, address

H. H. SMALLRIDGE, *Sec'y*,
Charleston, W. Va.

SOUTH CAROLINA BOARD OF EXAMINERS.

THE next annual meeting of the South Carolina State Board of Dental Examiners will be held at Columbia, S. C., beginning at 9 A.M., Tuesday, June 15, 1915.

All applications must be in the hands of the secretary not later than June 5th. Application blanks and instructions from the secretary.

Instructions for applicants. The attention of applicants is respectfully called to the following rules and regulations: (1) All applications must be in the hands of the secretary ten days before the meeting of the State Board of Dental Examiners. (2) Each application must be accompanied by a fee of fifteen dollars. (3) Each application must be recommended by three ethical dentists from the applicant's home town or nearest towns. (4) Each application must be accompanied by a photograph of the applicant, on the back of which photograph must appear the signatures of the three dentists who recommend the application. (5) The minimum preliminary educational requirement is a state high-school diploma or its equivalent—14 units. (6) Each applicant must present a diploma from a reputable dental college. (7) The practical work in operative dentistry will consist of one gold foil filling, one silicate filling, and one amalgam filling—applicant to furnish instruments and material. Probably with an extraction and pulp removal. (8) The practical work in prosthetic dentistry will consist of full upper and lower set of vulcanite teeth articulated in wax. Applicant must furnish full upper and lower models on an articulator, also teeth and wax. The work to be done in the presence of the board. (9) The practical work in crown and bridge will consist of a four-tooth bridge from first bicuspid to second molar, inclusive. This bridge to be constructed in the presence of the Board of Examiners. Applicant will furnish articulated model, material, and instruments; the board will furnish blowpipe and investment material. (10) The theoretical examination will consist of a written examination on all regular college branches.

R. L. SPENCER, *Sec'y*, Bennettsville, S. C.

NEW HAMPSHIRE BOARD OF REGISTRATION.

THE annual meeting of the New Hampshire Board of Registration in Dentistry, for examinations, will be held June 14, 15, and 16, 1915, at Masonic Banquet Hall, Manchester, N. H.

For application blanks or further information address

HARRY L. WATSON, *Sec'y*,
913 Elm st., Manchester, N. H.

NORTH CAROLINA BOARD OF EXAMINERS.

THE next regular meeting of the North Carolina State Board of Dental Examiners will be held at Wrightsville Beach, Wilmington, N. C., beginning promptly at 9 A.M. Monday morning, June 21, 1915. Full information and application blanks may be secured by addressing

F. L. HUNT, *Sec'y*, Asheville, N. C.

TEXAS BOARD OF EXAMINERS.

THE next regular meeting of the Texas State Board of Dental Examiners for the examination of applicants for license to practice dentistry in the State of Texas will be held in the high-school building, Dallas, Texas, beginning June 21, 1915, at 9 A.M.

No interchange of licenses with other states. No diplomas recognized. Rules governing examinations and official application blanks will be sent upon request.

All parties desiring to take this examination should send their application, accompanied by fee of $25, to the secretary not later than June 15th.

For further information address

C. M. MCCAULEY, *Sec'y*,
434 Wilson Bldg., Dallas, Texas.

DENTAL COMMISSIONERS OF CONNECTICUT.

The Dental Commissioners of the State of Connecticut hereby give notice that they will meet at Hartford, on Thursday, Friday, and Saturday, June 17, 18, and 19, 1915, to examine applicants for license to practice dentistry. Application blanks, revised requirements, etc., will be mailed by the Recorder upon request.

By order of the Commission.

Edward Eberle, *Recorder*,
902 Main st., Hartford, Conn.

OKLAHOMA BOARD OF EXAMINERS.

The Oklahoma State Board of Dental Examiners will hold its next regular meeting at Oklahoma City, commencing on Monday morning, June 14, 1915. Candidates will be examined both theoretically and practically. The practical part of the examination will require one gold filling, one amalgam approximal filling, one gold crown or Richmond crown or both. A full upper and lower plaster model, mounted on articulator, and teeth must be mounted, articulated, waxed, and ready for flasking. Only graduates of recognized schools are eligible to take this examination.

Emmett E. Heelin, *Sec'y*,
Oklahoma City, Okla.

NEVADA BOARD OF EXAMINERS.

The next regular meeting of the Board of Dental Examiners of Nevada, for the purpose of examining applicants and to attend to such other business as may come before the meeting, will be held in Carson City, in the capitol building, commencing June 18th.

Applicants for examination must communicate with the president or secretary of board ten days previous to examination, enclosing fee, $25. No interchange of license with other states. In its entirety, the Nevada law is practically the same as the California dental law.

David W. Rulison, *President*,
Reno.
W. H. Cavell, *Sec'y*,
Carson City.

NEW JERSEY BOARD OF REGISTRATION.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their annual meeting and examination in the Assembly chamber, at the State-house, Trenton, N. J., on June 28, 29, and 30, 1915. License fee, $25. No interchange of license. Practical test required: Gold filling in an approximal surface of a tooth, and one amalgam filling; also the soldering of a bridge consisting of three or more teeth, exclusive of abutments, and one Richmond crown, mounted and articulated, of gold or coin silver.

Attention is directed to the following requirement: "All applicants for a license to practice dentistry in New Jersey shall present to said board a certificate from the superintendent of public instruction showing that before entering a dental college he or she had obtained an academic education, consisting of a four years' course of study in an approved public or private high school, or the equivalent thereof." In accordance with the law, the secretary will issue application blanks only upon presentation of the required certificate from the superintendent of public instruction, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to the acting secretary.

Advance Notice.

At the meeting of the State Board of Registration and Examination in Dentistry to be held at the State-house, Trenton, N. J., December 6, 7, 8, and 9, 1915, the following practical tests will be required: Insertion of an approximal gold filling, compound approximal amalgam filling, and a silicate filling, besides a practical test of the applicant's ability in oral prophylaxis. Also preparation of a cavity for an inlay with wax pattern. Prosthetic dentistry: Five-piece bridge and Richmond crown in addition to an anatomical articulation of a full upper and lower set of teeth. Teeth to be furnished by applicant. Wax bites properly trimmed and in place on models for inspection before setting up teeth. In addition, dental jurisprudence and bacteriology will be added to the theoretical examination.

John C. Forsyth, *Acting Sec'y*.

MICHIGAN BOARD OF EXAMINERS.

THE next regular meeting of the Michigan State Board of Dental Examiners, for the examination of applicants who wish to practice dentistry in Michigan, will be held in the dental college at Ann Arbor, beginning Monday, June 14, 1915, at 8 A.M., and continuing through Saturday, June 19th.

For application blanks and full information apply to

A. W. HAIDLE, *Sec'y*, Negaunee, Mich.

ARKANSAS BOARD OF EXAMINERS.

THE Arkansas State Board of Dental Examiners will hold an examination at the Marion Hotel, in Little Rock, Ark., on Monday, Tuesday, and Wednesday, June 21, 22, and 23, 1915. Applicant must be a graduate of a reputable dental school. Examination theoretical and clinical. Application and fee should be in the hands of the secretary fully two weeks before the examination.

For further particulars write

IRVIN M. STERNBERG, *Sec'y*,
Fort Smith, Ark.

WYOMING BOARD OF EXAMINERS.

THE Wyoming Board of Dental Examiners will meet at Cheyenne, Wyo., in the Senate chamber at the State Capitol, on June 29 and 30, and July 1, 1915.

The written examination consists of anatomy, physiology, histology and bacteriology, chemistry and metallurgy, oral surgery, anesthetics, operative and prosthetic dentistry, materia medica and therapeutics, prophylactics, and orthodontia. Applicants must present a full plaster model of upper and lower jaws with teeth, also one without teeth. Practical work will be required from all candidates taking the examination. The candidate is required to furnish his own operating instruments, dental engine, amalgam, gold, wax, and modeling compound.

An examination is required of all applicants, and only holders of diplomas from reputable dental colleges are eligible to such examination. The board does not interchange with other states, nor issue any temporary permits.

For further information and application blanks, address

PETER APPEL, Jr., *Sec'y*,
P. O. Box 643, Cheyenne, Wyo.

VERMONT BOARD OF EXAMINERS.

THE next meeting of the Vermont Board of Dental Examiners, for the examination of candidates to practice in Vermont, will be held at the State-house, Montpelier, commencing at 2 P.M., on June 28, 1915, and continuing for three days.

To be eligible for examination a candidate —(1) must be twenty-one years of age, (2) must be a graduate of a high school of the first class, and (3) must be a graduate of a reputable dental college. Applications must be in the hands of the secretary not later than June 20th.

For further information apply to

GEORGE F. CHENEY, *Sec'y*,
St. Johnsbury, Vt.

MAINE BOARD OF EXAMINERS.

THE Maine Board of Dental Examiners will meet in the State-house, Augusta, Me., July 1, 2, and 3, 1915.

I. E. PENDLETON, *Sec'y*,
Lewiston, Me.

MONTANA BOARD OF EXAMINERS.

THE Montana State Board of Dental Examiners will hold a session for examination at Helena, Mont., on July 12, 13, 14, and 15, 1915.

G. A. CHEVIGNY, *Sec'y*,
Butte, Mont.

IDAHO BOARD OF EXAMINERS.

THE next meeting of the Idaho State Board of Dental Examiners will be held in Boise, beginning Tuesday, July 6, 1915, at 9 A.M., at the state Capitol.

For applications and other information address

ALBERT A. JESSUP, *Sec'y*,
Box 1414, Boise, Idaho.

SOUTH DAKOTA BOARD OF EXAMINERS.

The South Dakota State Board of Dental Examiners will hold its next meeting at Sioux Falls, S. D., July 13, 1915, at 9 A.M. sharp, continuing three days. All applications must be in the hands of the secretary by July 1st. Fee $25. Address

ARIS L. REVELL, *Sec'y*,
Lead, S. D.

ARMY DENTAL SURGEONS.

MEMORANDA OF CHANGES.

FOR week ending Saturday, April 10th:

Acting Dental Surgeon C. C. Mann, Med. Corps, reports on leave of absence from Fort Slocum, N. Y., until April 29, 1915, address 269 East Broad st., Columbus, Ohio.

For the week ending Saturday, April 17th:

Leave of absence for three months, to take effect upon his relief from his present duties, is granted First Lieutenant S. Davis Boak.

For the week ending Saturday, April 24th:

Acting Dental Surgeon A. J. Skillman, recently appointed, will proceed to Ancon, Canal Zone, and report in person to the commanding general U. S. troops for assignment to duty, and by letter to the commanding general, Eastern department.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING APRIL 1915.

April 6.

No. 1,134,450, to ERNEST S. GOLDY. Tooth-brush.

No. 1,134,459, to LOESER KALINA. Folding tooth-brush.

No. 1,134,524, to ERNEST FOWLER. Receptacle and closure therefor.

No. 1,134,680, to JAMES W. IVORY. Fastening for an artificial tooth.

No. 1,134,692, to WALTER L. MASON. Dental marking and spacing tool.

No. 1,134,833, to FRANK F. FISCHER and CORNELIUS M. KALETSKY. Dental engine tool guard.

No. 1,134,865, to CLARENCE WHEELER JONES. Magazine brush.

No. 1,134,965, to ALBERT H. TAYLOR. Artificial tooth.

April 13.

No. 1,135,007, to GUSTAV E. FRITZ. Artificial tooth.

No. 1,135,625, to RALPH B. SAVIN. Bur stand.

No. 1,135,629, to HORACE F. SMITH and HARRY S. DANO. Dental articulator.

No. 1,135,922, to JOHN REBROVICH. Brush guide for dentifrice-container.

April 20.

No. 1,136,100, to HERMAN E. S. CHAYES. Dental instrument.

No. 1,136,184, to GEORGE W. TODD and CHARLES D. MENDLIK. Dental bridge.

No. 1,136,617, to FRANK RITTER. Chair base.

No. 1,136,649, to HARRY M. BROCK. Dental instrument.

No. 1,136,664, to GUSTAV E. FRITZ. Artificial tooth.

April 27.

No. 1,137,015, to FREDERICK H. NIES and JOHN F. CARETTO. Artificial teeth.

No. 1,137,298, to WILLIAM ERNEST WALKER. Orthodontia device for influencing the alveolar process and unmerged teeth.

No. 1,137,585, to THORNTON CRAIG, Jr. Dental appliance.

No. 1,137,651, to ELMER METIVIER. Tooth-brush.

DR. KIRK ADDISON DAVENPORT

THE

DENTAL COSMOS.

VOL. LVII. JULY 1915. No. 7.

ORIGINAL COMMUNICATIONS.

NEW PROBLEMS REGARDING TUBERCULAR INFECTION, AND A SPECIAL TREATMENT FOR CERVICAL ADENITIS FOLLOWING ORAL SEPSIS.

By BENIAMINO DE VECCHIS, M.D., D.D.S.(Univ.Pa.), Naples, Italy,
ASSISTANT TO PROFESSOR CASTELLINO, INSTITUTE OF SPECIAL MEDICAL PATHOLOGY OF THE ROYAL UNIVERSITY OF NAPLES.

(Presented to the Cryer Oral Surgery Society of the Evans Dental Institute, University of Pennsylvania, March 10, 1915.)

TUBERCULOSIS is the greatest scourge afflicting humanity, and it very frequently ends the existence of the young at a period when they are best fitted to contribute to labor, and to progress and civilization. For this and other reasons students of biology and practitioners of the various branches of medicine and surgery are constantly endeavoring to add to our knowledge of this terrible evil, in the hope that a sure remedy for it may be found.

I will endeavor to explain briefly some new problems arising from such studies, together with a special method which I have devised for the treatment of cervical adenitis following oral sepsis.

At the present time we find under one classification, scrofula, lupus, and pulmonary tuberculosis. When the invaluable studies which Prof. Otto Van Schrönn has made to distinguish the bacteriological differentiation and varying crystallization as between the tubercle bacillus of Koch and the phthisiogenus bacillus are made known to the scientific world, a great light will be thrown on these morbid processes and we shall surely be furnished with clearer means of distinguishing among the pathological manifestations referred to.

Dr. Van Schrönn's researches demonstrate that when broth cultures of the tuberculosis bacillus of Koch are suspended in hanging-drop preparations, a crystallization takes place after some months. Crystals are also formed in like manner in the case of the phthisiogenus bacillus. When the crystals are examined a marked difference is found to exist between those from the tuberculosis bacillus and the phthisiogenus bacillus. The crystal from the latter organism

belongs to the prismatic system, while those from the bacillus of Koch are octahedral.

Until a few years ago, were not tertiary manifestations of syphilis, together with tubercular growths, actinomycosis, and superficial cancers of the skin, surrounded by a veil of non-distinction? Today, pathological anatomy, inoculation experiments, and bacteriology have established the fact that lupus, scrofula, and phthisis belong to the class of tuberculosis. This is definitely settled; each disease, however, preserves its morbid entity, not only from the symptomatic and therapeutic points of view, but also, as will be proved, from the etiological aspect. Doubtless the morbid agents belong to the same family; their variation, always within certain limits, is in their virulence, in their size and shape, and in what is apparently spore formation.

What do we know about the modifications in the life of bacilli? Researches seem to show that there are three cycles in the development of the bacillus of Koch. In the first the bacillus is smooth, with ramification, elongation, and formation of terminal capsules or spores. These spores are granules which take the Gram stain intensely, and which finally elongate and reproduce the smooth form of the bacillus. The second stage is that of a fragmentation of the bacillus with formation of Gram-resistant bodies which are also acid, resistant. This form is found especially in the lung. The third cycle is that of a rosary formation, when there is formed a series of granules which are intensely acidophile, and are resistant to Gram stain. (*Riforma Medica,* January 30, 1915, abstract by the *New York Medical Journal,* March 31, 1915.) Now, why is it that Koch, Schuchardt, Krause, Pianese, Lustig, Marchiafava, Cormil, Bakes, while examining the giant cells of scrofula and lupus, notwithstanding their supreme technical ability, have not discovered the tubercular bacillus in all cases? As to inoculation, Arloing says that the bacilli of cervical adenitis have a milder virulence and therefore it is difficult to obtain a culture of the same; also pathological anatomy shows these diseases to be closely related but not identical.

Actually, still acknowledging the predisposing influence of the organic factor, of bad nutrition, of miserable conditions, and of hereditary influence, the greatest importance must be assigned to the infective agent. I believe that scrofula is a disease of childhood and adolescence for the reason stated by Behring, viz, the protective epithelium has low resistance. A small primary break in the epithelium is necessary to effect the results of tuberculosis, *i.e.* to admit of the entrance of the infective agent. This shows that there is still a long way to go before reaching a perfect elucidation of these problems.

Prof. Randle C. Rosenberg holds that it is the number of bacteria and not their type that causes the septic condition. In no part of our body can we find a richer pabulum for the multiplication of bacteria than in the mouth.

Prof. E. E. Stewart says that the tubercular bacillus learns in the mouth, particularly, to digest the living human tissue and to become a destroyer of man, like the tiger that sucks human blood.

It is my conviction that the tubercular infection of the cervical glands is primary in the majority of cases. Decayed teeth, gingivitis, adenoid tumors of the pharynx, hypertrophied tonsils, and also certain very small lesions, are the main portals of entrance of such bacteria.

Of 12 guinea-pigs which I injected with products of dental decay, 5 died with tubercular peritonitis.

Dieulafoi injected a series of guinea-pigs with parts of the tonsils of man. Of 61 animals so treated, 13 per cent. were affected with general tuberculosis.

Pieces of adenoid exuberation (Wilson) on the tonsils were injected in 35 pigs, and 20 per cent. of them acquired tuberculosis.

In the cases where the infection is secondary to tuberculosis of the lungs, bones, and lips, the glands do not become

excessively enlarged, but we have a micro-poliadenopathy, while in a primary infection we have enlarged glands which tend to break down.

Many treatments have been employed in adenitis up to the present time, such as application of the X-ray, heliotherapy (exposure of glands to the direct sunlight), extirpation, injection of iodin, carbolic acid, etc. The results of treatment have varied and have not always been beneficial. In using the following methods I have not failed in a single case:

I prescribe antiseptic washes of the mouth and antiseptic gargles of the pharynx, especially after meals, and treat the inflammation of the tonsils with silver compounds. I treat the caries of the teeth and fill all cavities. Contemporaneously, twice a week, with a syringe prepared with needles of special size, I make parenchymatous injection of a liquid to be described later into the gland, turning the needle in all directions in the gland, and liberating the drug drop by drop. The injection is followed by slight massage externally, and by application of tincture of iodin and warm cotton for twenty minutes. When the suppuration has begun I aspirate all pus-like liquid, and the same process is followed. If the patient can come to the office, it is better for him to have daily injection of 1 cc. of the solution in the gluteal region. In regard to parenchymatous injection, the operator may pay particular attention to aseptic and antiseptic rules to avoid mixed infections.

The patient is directed to avoid smoking, also the drinking of intoxicating beverages, and he is advised to live in fresh air as much as possible, to sleep with windows open, to eat as much as he can of the most nutritious food.

This treatment does not cause permanent scar or fibrous thickening, which fact is an important one for the esthetics of the neck, especially in women. It also permits the gland to accomplish its functions—which, although not well known, still must have a place, for every organ must have its function.

FORMULA, AND EFFECTS OF INGREDIENTS.

The formula for the injections is as follows:

Take—Synthetic guaiacol Merck,	gm.	6
Metallic iodin,	"	3
Sodium iodid,	"	6
Glycerin,	"	30
Saccharin,	"	0.50
Distilled water,	"	10

Misce et solve.

Sig. For injections.

I inject one or two cubic centimeters of this solution according to the size of the gland. The effect of guaiacol on the tubercular processes is shown by well-known authorities—Schuller, Sommerbrodt, Frantzel, Horner, Bouchard, Gilbert, Labadie, Lagrave, Picot, Pignol, Maragliano, Durante, Pascale, Castellino, Marfori.

Guaiacol has a strong reducing action on the organism, due to its transformation into pyrogallol (Kültz). It has an antiseptic and disinfecting action against Koch bacillus, causes marked modifications in the tubercular structures, infiltrations, and deposits.

I will relate an experiment of Professor Marfori: The bacillus of tuberculosis subjected for two hours to the action of guaiacol solution, of one or two parts per thousand, and then injected in the anterior chamber of the eye of rabbits, or subcutaneously in guinea-pigs, will not produce a general tubercular infection, as they do under ordinary conditions, but at most only a localized infection at the point of injection.

Guaiacol, furthermore, is capable of abolishing sensibility of the terminal nerve fibrils, and in consequence is a local analgesic.

Iodin is an energetic antiseptic and disinfectant. The tubercular bacilli are killed shortly after being subjected to the action of tincture of iodin. It is an energetic prochemiotactic substance capable of producing a local or general leucocytosis, and also raises strongly the opsonic index of the blood serum for the bacillus of Koch, thus favoring its engulfing by the phagocytes. (Opsonins

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

are substances soluble in animal sera, having the property of so altering bacteria as to prepare them to be engulfed.) Iodin also has a vaso-dilating action, and where the blood goes there also go the leucocytes, which are the dependable soldiers and the scavengers of the body. Iodin also determines certain physico-chemical modifications of metabolism.

The viscosity of the blood is much reduced by the action of iodin (Muller-Inada). Dogs subjected to the action of iodin show a diminution of viscosity of the blood and an increase of electrical conductivity (Chistoni).

Iodin has the property of strongly exciting lymphoid tissues (Laté, Lostat, Jacob). Iodin salts injected subcutaneously in the blood produce increase in lymph and mononuclear corpuscles.

Sodium iodid has an action similar to metallic iodin, only milder in degree, and it is solvent of its own metal.

Glycerin is not easily oxidized and is slightly antiseptic, being a fatty solvent; iodin and guaiacol are not easily broken up by it, hence have a longer action, circulating in the system for weeks or even months. This is proved by the fact that, following a course of treatment, the urine of the patient will give the reaction for iodin.

Saccharin, as is well known, is 300 times sweeter than sugar, and is capable of diminishing strongly local pain, as Caforio has proved.

Water is for the purpose of a solvent and diluent.

After each injection, the gland becomes more tumid, warmer, and more reddish; but after one or two days it begins to diminish in size, and then the injection is repeated.

CLINICAL OBSERVATION.

Case I. Miss A. S., eighteen years. Parents living and healthy. Nothing important in the anamnesis. Her first lower right molar was extracted when she was sixteen. At present she has various teeth filled and a caries of third degree in the upper right second molar. She had no fever. She had tubercular glands in the superclavicular region, some of them being as big as a nut. After a month of treatment, all the glands disappeared.

Case II. Miss I. L., sixteen years. Her father died in an accident. Her mother died from tubercular bronchitis. Has two healthy sisters. She is pale, anemic, and feverish in the evening. She was discharged from her place of work on account of some adenitis appearing on her neck. She was at the Pennsylvania Hospital for two months, where she was treated with belladonna ointment locally applied. She was sent to a dentist by the hospital doctors. The dentist found her teeth perfectly healthy. Examination shows that her pharynx is slightly inflamed. In the submaxillary region she has two glands, one suppurated but not open, the other having a strong infiltration. After twenty days of treatment she was able to return to the factory. Fever disappeared and she gained several pounds.

Case III. (Figs. 1 and 2.) Miss C. P., twenty-one years. Her mother had pleuritis when young. The patient had the lower first molar destroyed by caries; the roots were extracted. She presents deforming scars in the superhyoid region due to removal of a gland. Has a gland as large as a hen's egg and very hard at the right side of the scar on the middle line of the neck. A doctor whom she consulted had advised the removal of the gland. After a month of my treatment the gland presented no modification whatever; but with a consecutive general treatment and weekly local injection the gland gradually diminished and finally disappeared, as the figure shows. At present her appetite is greatly improved and she has gained seven pounds; her complexion, formerly of a greenish pale tint, is now pink.

Case IV. A. N., a boy of eight. His mother suffers from tubercular bronchitis. He has a broken upper incisor, with caries in other teeth. Has a gland in the carotid region. After twenty days of local and general treatment his health was perfectly restored.

Case V. (Figs. 4 and 5.) A. P.,

a lad of eighteen. His father died of heart disease; mother and sister are living and healthy. He has a considerable acne adolescentium in his face and numberless tubercular glands, some suppurated and others not. He shows various scars, of which the most important is in the pre-auricular region, due to past cutting for the treatment of his adenitis. I am giving him local and general treatment, and the glands are now diminishing, as shown by the figure. Many other cases, treated in the same manner, have shown similar results.

Last year Professor Arnaldo Cantani, first assistant in the Institute of Medical Clinic of the Royal University of Naples, directed by Professor Cardarelli, made some studies on the cryptogenetic pre-tubercular infections, and on the tubercular bacillemia of Jousset. He cites fifty clinical observations in which general infection has not caused adenitis, but micropoliadenopathy. These cases were treated with iodin injection, and all the patients got well. (*La Clinica Italiana,* June and July, 1914).

I cite these cases to show that adenitis is not dependent on general infection, but on septic infection of the mouth, and to show that in general infection, also, iodin injection gives the best results.

ANOCI-ASSOCIATION IN DENTISTRY:

A Review of the Present Status in Dentistry of General Anesthesia by Nitrous Oxid and Oxygen and of Local Anesthesia by Novocain-Suprarenin Respectively.

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(Read before the Susquehanna Dental Association of Pennsylvania, at its annual meeting, Wilkes-Barre, Pa., May 18, 1915.)

WHEN looking over the annals of dentistry, the observer is forcibly struck with the multitude of methods employed in every branch, of theories advocated in rapid succession, of fads cherished for a short time and abandoned. While this phenomenon is not a reprehensible one, as it evidences a spirit of continuous progress, yet it produces the impression of a lack of standards such as might govern the theory as well as the practice of dental science and lend to it greater stability and uniformity. There are, to be sure, a few methods which have stood firmly in the rise and fall of the tides of popularity, such as the malleted gold filling, porcelain in its various applications, arsenic, and a few others; yet by none is this whimsical vacillation and repeated vindication more clearly exemplified than by nitrous oxid and oxygen anesthesia.

EARLY AND RECENT INVESTIGATIONS ON NITROUS OXID AND OXYGEN ANESTHESIA.

If dentistry had nothing more to its credit than the discovery of nitrous oxid anesthesia, this one achievement alone would forever stand out as one of the greatest accomplishments of the human mind and an inestimable benefaction to mankind. The reason why this method with all its advantages has been subjected to great fluctuations in the profession's favor cannot be solely attributed to slowness in the evolution of apparatus suitable for its administra-

tion, especially in combination with oxygen. Had the dental profession closely followed the lead of Horace Wells and delved more industriously and deeply into the physiology and pharmacology of nitrous oxid anesthesia, they could not have helped arriving much sooner at devising means for the safe prolongation of deep anesthesia for extensive and more serious operations, at determining the proportions of other anesthetics suitable for admixture to nitrous oxid for the elimination of a few undesirable features, and at perfecting analgesia with nitrous oxid and oxygen for minor but extremely disagreeable and painful operations, which last method has been found such an invaluable accessory by a large number of practitioners. In justice it should be said that a few members of the dental profession have industriously labored to perfect and safeguard for dentistry the remarkable aid which in every sense of the word is dentistry's own merit. Experiments are under way as to the effects of nitrous oxid on blood pressure, on the chemistry of the blood, on respiration and the secretory organs, being conducted notably by the investigators working under the auspices of the class of anesthesia of the Academy of Stomatology of Philadelphia, and some very striking data have been reported. But it can hardly be asserted that the profession at large have lent to investigations of this kind their due share of support, by closely observing and recording the effects of nitrous oxid, alone or in combination with other anesthetics, upon the respiration, circulation, metabolism, and psyche of patients of all ages and conditions of health. Usually a rank empiricism has been thoughtlessly indulged in, rules of thumb rather than rules of science have governed most administrations, and an immense bulk of invaluable data has been disregarded and lost, and must be collected all over again. Here, if anywhere, is a most fertile field for that earnest co-operation of the practical with the theoretical man which is being more and more generally urged.

EXPERIENCE IN APPLYING ANESTHETICS A PRIME REQUISITE.

Surely, no one would expect to be able to insert a gold filling *lege artis,* or to set up and finish an anatomically articulated denture without having previously given several years of study to the theoretical and practical factors involved in the achievement of such a task. How, then, can anyone expect, without having given an ample time to the study of the theory and the practical application of anesthesia, to be proficient in administering nitrous oxid and oxygen anesthesia, where factors really vital to the patient's health are concerned? Of what value, therefore, can be the condemnation of nitrous oxid and oxygen anesthesia and analgesia by men who have merely toyed with these tasks? A laparotomy cannot be performed upon the directions of the most ideal text-book, neither can successful anesthesia or analgesia be achieved after reading a general text-book on anesthesia, witnessing a few practical demonstrations, and making half a dozen more or less disappointing attempts at administering these anesthetics.

Thus we have today the anomalous situation that, though dentistry has discovered and perfected to a high degree the discipline of nitrous oxid anesthesia, many of its disciples after a perfunctory trial have abandoned its practice, and without anything like just grounds have condemned it wholesale, while their condemnations in reality are nothing more nor less than a confession of inefficiency and lack of close application. In this way it has come about that, while the voices deprecating the use of nitrous oxid and oxygen anesthesia and analgesia are growing in number and volume in the dental camp, the medical profession, having gradually overcome within recent years their prejudice toward anything that savors of dentistry, are becoming more and more enthusiastic about the safety, the comfort, and the efficiency of nitrous oxid and oxygen anesthesia in the performance of surgical operations.

CHOICE OF ANESTHETIC.

Another regrettable shortcoming in this field of endeavor is the lack of discrimination concerning the fitness of a method for the case in hand. Universal methods are nowhere less suitable than in anesthesia. Every individual is a cosmos in himself, and demands a painstaking selection and modification of the anesthetic means particularly suitable for his *and only his* case. Personal, physical, emotional, traditional, environmental, racial, climatic, and many other factors, in their particular mixture in each patient, determine the selection of the anesthetic method of choice in his case, or the modification of the method decided upon after serious consideration of all these factors. A good memory for average rules and percentages does not make a safe anesthetist, even in a fairly normal case. Human beings are not simple chemical reagents, but complexes of most intricate nature; hence the standpat point of view, the blindly sworn-to slogan "I am of Paul," or "I am of Apollos," in dealing with human beings, is a confession of limitation.

THE SAFETY OF NITROUS OXID AND OXYGEN.

As for the safety of nitrous oxid and oxygen anesthesia and analgesia, the statistics undeniably accord this anesthetic method an enviable record of innocuity, and it is to be regretted that some statements, such as that presented by Dr. Albert H. Miller, in an extremely confusing form (see *New York Medical Journal,* January 24, 1914, and "Fatalities Under Nitrous Oxid and Oxygen Anesthesia: A Correction." DENTAL COSMOS, June 1915, page 705), have befogged the issue. But the very recent statement by Crile of Cleveland that "The anesthetists at Lakeside Hospital and Dr. Teter have administered nitrous oxid and oxygen 18,250 times for general surgical operations, and 16,714 times for oral operations, making a total of 34,964 general anesthetizations without a fatality," surely carries convincing weight, especially since it is hardly probable that a general practitioner of dentistry would exceed that liberal number of anesthetizations within a lifetime of practice.

THEORY AND PRACTICE OF ANOCI-ASSOCIATION AS EVOLVED BY DR. CRILE AND DR. LOWER.

One of the most welcome examples of the practical interest which general surgery has within recent years been taking in nitrous oxid as an anesthetic agent has been furnished by Dr. Crile and Dr. Lower of Cleveland in their important studies on anoci-association.* The trend of their forceful arguments is briefly as follows:

Every adequate stimulus to which we are exposed awakens an ontogenetic or a phylogenetic memory or association, and the nerve mechanism evolved by countless similar experiences in the life of the individual or of his race makes an appropriate response. These associations are either injurious to the individual, viz, noci-associations, or of benefit to the individual, viz, bene-associations, and it is the natural tendency of every human being to increase the former and decrease the latter, and to reach as much as possible a state of anoci-association. In warding off noci-associations, that is real or imaginary danger, man discharges energy. These discharges of energy, when intense and prolonged enough, produce the extreme conditions called "exhaustion" and "shock." Shock, therefore, is the result of the excessive conversion of potential into kinetic energy in response to adequate stimuli. According to this kinetic theory of shock, the essential lesions of shock are in the cells of the brain, the suprarenals, and the liver, and are caused by the conversion of potential energy into kinetic energy at the expense of certain chemical compounds stored in the cells of the brain, the suprarenals, and the liver. Shock may be produced by divers causes, such as fear

* "Anoci-association." By Geo. W. Crile and W. E. Lower. Philadelphia, 1915.

and worry, physical injury, infection, hemorrhage, excessive muscular exertion, starvation, insomnia. By a series of wonderful experiments in animals, Crile and Lower have furnished incontrovertible proof that all these conditions cause physical alterations in the cells of the brain, the suprarenals, and the liver, and that these physical changes are identical, regardless of their cause; and that those cells which reach a certain degree of alteration cannot be restored, but go on to annihilation. All agents that activate the kinetic system, traumatic, emotional, toxic, foreign proteid, or drug, produce identical changes in the cells of the brain, the suprarenals, and the liver, and also increase the adrenalin output. Many histological examinations of the brain cells and the adrenalin output made after the administration of ether, urethane, nitrous oxid and oxygen, however, showed that none of these inhalation anesthetics caused either brain-cell changes or increased adrenalin output—excepting ether during the state of excitement. In comparing the morphological changes of the brain cells in animals anesthetized either by ether or by nitrous-oxid-oxygen and subjected to a given amount of trauma, the important discovery was made that the changes in the brain cells were approximately three times as great under ether anesthesia as under nitrous-oxid-oxygen anesthesia; that the fall in the blood pressure was on the average two and one-half times greater under ether than under nitrous-oxid-oxygen; and finally, that the condition of the animal was worse after trauma under ether than after equal trauma under nitrous oxid and oxygen. In the course of operations on the human body, the protective effect of nitrous oxid and oxygen is constantly observed. Moreover, the mere excitation due to the feeling of suffocation while inhaling ether causes a certain amount of exhaustion from which the patient is spared when taking nitrous oxid—which, unlike ether, owes its anesthetic property to its interference with the use of oxygen by the brain cells.

When we transfer these observations to operations in human beings, it becomes immediately apparent that all untoward, nocuous stimuli which activate the kinetic system causing the brain cells to discharge and lose some of their stored energy must be avoided. The brain, therefore, is to be protected against destructive psychic stimuli as well as against the destructive operative stimulation, and, since no one single anesthetic can alone produce anoci-association, this can only be achieved by the selection and combination of such anesthetics as will exclude all stimuli from the brain, and insure anoci-association. These stimuli, however, do not begin to exert their nocuous influences in the operating room. The pre-operative, operative, and post-operative conscious or unconscious impressions of the patient demand equal consideration. Hence, by minimizing the patient's fear by an assuring pre-operative environment, by judicious attitude of operator and assistant, and avoidance of noises; by the definite dulling of the nerves through the administration of a narcotic previous to operation; by the gentle and gradual administration of a non-suffocating, odorless inhalation anesthetic, namely nitrous oxid and oxygen; by a local anesthetic, namely novocain, to cut off all afferent impulses during the course of operations; by gentle and swift manipulation; by a second local anesthetic which will protect the patient during the painful post-operative hours:—by the combination of all these methods the patient is protected from damage from every factor excepting those which exist in the diseased condition from which relief is sought.

APPLICATION OF ANOCI-ASSOCIATION TO DENTAL OPERATIONS.

It goes without saying that the above outlined routine of anoci-association would be too complicated for average dental operations. Yet there is no doubt that dental operations, no matter of what nature, frequently produce a large amount of shock, and all precau-

tions should be taken to avoid this as much as possible. The patient's social, mental, and physical status, age, and sex must determine what portion of the anoci-procedure must be observed so as to eliminate shock or reduce it to a minimum. These individual factors, which must be taken into account from case to case, will also determine the choice of the anesthetic; for the patient's welfare, not the operator's prejudice for one or the other method, must be the first consideration. Hence, no dental operator who is familiar with but one method should consider himself competent in anesthesia, nor can any dental office which offers anesthetic facilities of but one kind be regarded as efficiently equipped.

It would exceed the limits of this paper to give even a brief outline of the technique of nitrous oxid and oxygen anesthesia and analgesia. May I, however, point out a few of the nocuous factors which in all probability account for many failures in nitrous oxid and oxygen analgesia? All unpleasant sights, such as waste, unclean linen, blood, instruments; all disturbing noises without and within the operating room, such as passing vehicles, banging doors, clanking instruments; all deficiencies in the operator's or his assistant's dress or deportment; neglect in loosening properly the patient's clothing or seating him comfortably; improper heating or lighting, and a hundred other seemingly trifling details, may affect the patient in such a way as to prove a serious disturbance in the production of such a delicate mental and physical intermediary state as analgesia, or twilight sleep. Thus we can fully appreciate the case of a fastidious patient not yielding to the efforts at inducing analgesia being made by an operator with unclean finger-nails. He may be forced into the anesthetic stage, but not without producing shock.

A thorough knowledge of the physiology and pharmacology of nitrous oxid and oxygen anesthesia and analgesia, judicious consideration of the patient's particular requirements and peculiarities—pulse, respiration, color and physical characteristics; a reliable and thoroughly practical apparatus and intimate familiarity with its working possibilities, a correct gaging of the patient's lung capacity instead of reliance upon an average percentage, arrangement of the patient's body suitable to the character of the operation, proper adjustment of the inhaler, intimate familiarity with and correct interpretation of the symptoms, are prime requisites for success.

PRE-OPERATIVE MEDICATION.

One feature in anesthesia and analgesia which has received altogether too scant consideration by the dentist, is pre-operative medication by mild narcotics. The most suitable of these for dental operations are bromural (alpha-brom-isovaleryl-urea), one tablet (equal 0.3 gram) for children, two tablets for adults, to be taken with water from thirty to forty-five minutes before operating, and chloral hydrate, from 0.5 to 1 gram. In cases of great excitement and fear, camphorated validol, 10 drops in a little water; or in extreme cases, morphin 0.02 gram and hyoscin 0.005 gram in aqua destillata 10 cc., from 6 to 8 drops in a tablespoonful of water; or morphin 1/5 grain and scopolamin 1/150 grain, hypodermatically, the dose in alcoholics and especially muscular men to be $\frac{1}{4}$ gr. morphin and 1/150 gr. scopolamin. These pre-operative sedative measures apply to general and local anesthesia alike.

REQUIREMENTS FOR SUCCESS IN LOCAL ANESTHESIA.

Turning to local anesthesia, it is perhaps not superfluous to emphasize the fact that this form of anesthesia, even with the remarkably safe and efficient chemical means at our command today, the perfected instrumentarium, and the clearly defined technique of administration by infiltration or conduction, is by no means easier to master than general anesthesia. In reality, he who is unwilling to study religiously the physiologic and pharmacologic action of novocain and suprarenin, to practice carefully the method of making proper solutions, to

delve industriously into the anatomy of the parts involved, to acquire conscientiously the intricate technique of the various forms of injection, and to observe scrupulously the exacting demands of asepsis, will not only do more harm than good to his patients and himself, but will bring discredit upon an extremely valuable method. Since Professor Guido Fischer—to whom, together with Professor Braun, we owe practically entirely the perfection of local anesthesia in general and dental surgery respectively, though a great many recent dental writers on this subject seem to make a practice of withholding due credit—gave lectures and demonstrations on novocain-suprarenin anesthesia in this country, this method has been eagerly adopted by the dental profession here, and enthusiasm has run so high that, in all probability, the tide will soon turn again, and disappointment, if not unreasonable condemnation, will attach to the method, although properly chargeable to the operator's lack of proficiency. The more fully an operator realizes the advantages to be derived from novocain-suprarenin anesthesia, the more vigorously will he protest against an indiscriminate or careless practice of this method—for, should it once become suspect, even though owing to entirely avoidable accidents, its ostracism by the dental profession would soon result.

Applying local anesthesia to anoci-association, it is evident that the factor which is most liable to produce shock is the patient's fear of being "operated upon" while fully conscious. This is best overcome by the operator's and his assistant's reassuring attitude, by engaging the patient's interest, as in the preparation of the solution, by pre-operative sedative medication, and by frankness in regard to the sensations which the patient is likely to experience. A strong personality, power of conviction and suggestion, and a gift of discrimination, will stand the operator in good stead. In persons of timid or neurasthenic type, the induction of nitrous oxid and oxygen anesthesia or analgesia will often be preferable to local anesthesia; and while the operator's judgment must be the ultimate criterion as to the method of choice, the patient's wishes, if reasonable, and his mental condition, demand consideration.

PAINLESS INSERTION OF THE HYPODERMIC NEEDLE.

The introduction of the needle is another factor in local anesthesia which may arouse the patient's fear and cause shock. This needle prick is, in the majority of patients, amply disguised by the previous application of iodin to the point of injection, which thus serves two useful purposes, viz, of desensitizing as well as sterilizing the mucous membrane at the point of injection. In more sensitive persons the previously dried mucosa can be anesthetized by applying locally a swab of cotton saturated with 30 per cent. pure novocain solution, or by rubbing a pluglet such as is used in pressure anesthesia into the mucous surface with a large-head burnisher dipped in sterile water. If a number of injections are to be made for an extensive operation, nitrous oxid and oxygen analgesia or even anesthesia can be most advantageously resorted to; the injections are made while the patient is in the analgesic or anesthetic state, and the operation is made either under local anesthesia alone, with the patient's eyes covered with a napkin, or again, under nitrous oxid and oxygen analgesia or a light anesthesia during the actual operation, according to the individual requirements of the case. In this way extensive operations, such as the removal of tumors or necrotic bone, resections, exarticulations, or setting of fractures can be carried out with a minimum of shock to the patient and a maximum of convenience to the operator.

In cases selected after the principles enumerated above for infiltration or conduction, another possible source of shock is avoided by a mastery of the technique and by slow, deliberate manipulation of the needle, which in infiltration should be advanced only into layers of tissue already anesthetized, and in conduction must be guided with infallible certainty of aim by deft fingers trained to delicate palpation and prob-

ing into tissues the anatomic arrangement of which must ever be, layer by layer, before the operator's mental vision. Only if such mastery of technique, coupled with appreciation of the importance of correct isotonia, dosage, temperature and sterility of the solution, the strictest adherence to the rigorous precepts of asepsis in every phase of the operation has become a matter of course, an inviolable canon, with the operator, can he expect unmarred success in this excellent method, and escape the stigma of avoidable untoward experiences, of which an exuberant crop will surely be reported unless the exacting requirements of proficiency in every detail are fulfilled. As a German anesthetist used to tell his students in concluding a laborious course in anesthesia: "If you will not do it right, better leave it alone!"

THERAPEUTIC MEASURES IN COLLAPSE.

Any alarming symptoms arising in the course of a general or local anesthesia are the more easily combated, the more quickly the operator applies suitable antidotes which will also minimize shock. The first few seconds are the most valuable for resuscitation, hence it behooves the operator to be familiar with restorative means and to have them at his elbow. The German law making it a misdemeanor for an operator to administer an anesthetic without having at least a sterile hypodermic syringe and ampules containing strychnin or camphor in oil ready for use, deserves emulation.

If light symptoms of collapse appear, such as pallor, nausea, palpitation, rapid pulse, perspiration, trembling, a decoction of black coffee, fresh aromatic spirits of ammonia, or camphorated validol 8 to 10 drops in a tablespoonful of water, may be advantageously given. The inhalation of amyl nitrite, placing of the patient's head in a recumbent position, heart stimulation, wrapping of the chest in wet cloths, a hypodermic injection of camphor in oil, inhalation of oxygen, and artificial respiration, must be resorted to in proportion to the gravity of the symptoms arising and the degree of effect of the restorative means employed. Again, the more quickly these restorative means are applied the milder their nature may be, and the more successfully will shock be warded off.

POST-OPERATIVE TREATMENT.

The post-operative care of the patient is not least in importance, if health is to be restored in the shortest possible manner and a perfect anoci-sequence is to be obtained. A painless and rapid process of repair is best insured by protecting wounds, as for instance those due to extractions, against external stimuli and irritation of the traumatized tissues, by spraying or tamponing with pure orthoform or novocain powder, according to Spiess' method, after previous antiseptic dressing with 10 per cent. iodoform or europhen. No inflammation will develop if the reflexes conveyed from the traumatized area by way of the afferent sensory nerves are successfully blocked by anesthesia, and the normal function of the vasomotor nerves is not interfered with. Internal administration of trigemin 0.25 gram per dose, pyramidon 0.3 gram per dose, or aspirin 0.3 gram combined with pyramidon 0.1 gram, will render excellent service in preventing post-operative shock and allaying after-pain.

CONCLUSION.

In conclusion, let me reiterate that the operator who wishes to reap for his patients and himself the benefits of anesthesia, must spare no efforts to become fully competent in the application of at least the two safest methods of general and local anesthesia—namely, those by means of nitrous oxid and oxygen, and by novocain and suprarenin; he must never allow his prejudice for one or the other method to influence his choice in each case, and must conduct every operation from beginning to end in such a manner as to eliminate as much as possible every source of shock and to insure perfect anoci-association.

THE PRACTICE OF PRESSURE CASTING: COMPILED FROM THE RECENT AMERICAN LITERATURE.

By CLARENCE J. GRIEVES, D.D.S., Baltimore, Md.

(Report presented to Section V, Sixth International Dental Congress, London, 1914.)

"ALL true science begins with empiricism, although all science is science for the reason that it strives to pass out of the empirical stage." (Huxley.) "Practical" is defined (Century Dictionary) as "relating or pertaining to action, practice, or use; derived from experience; capable of being used or turned to account; contributing to one's material advantage, possessing utility; opposed to theoretical, speculative, or ideal." Practical knowledge is said to be the "knowledge the end of which is action."

So the practical side of the casting question is the knowledge gained from experience which ends in action; the production of, not words or theories, but a casting which contributes to our material advantage and can be applied with accuracy. There can, in a broad sense, be nothing practical which is not intensely scientific, and successful practice is science applied to our work; but many methods are producing comfortable results, the reason for which we do not know. In fact, the major portion of our practical actions is empirical; and the reason or science for such action will have to be discovered later.

The scientific side of pressure casting is involved in another report; and where the science is known, the two reports interchange. Dividing this subject broadly into the operative and prosthetic fields, we must again subdivide it into the direct and the indirect methods: the *direct* was practically the original method of dentistry; the *indirect* consists in the interposition of an impression and cast of the field to be copied—with many variations. After the wax pattern is obtained the procedure is the same as in the direct method.

Direct Method (Taggart's).

Of these methods, the consensus of opinion obtained from a study of the literature on the subject is decidedly with the direct method, which is that of Taggart, and will be described in his own words.

Whatever the discussion, still continued, as to methods of casting as applied to dentistry prior to its introduction by Taggart, pressure casting as applied to the whole field of dentistry has so completely revolutionized modern methods, and in the language of the definition has proved so capable of "contributing to one's material advantage," that all honor is due to W. H. Taggart, who, no matter what the court decisions as to priority of invention, was the first to bring it to our notice, and who deserves all possible credit for its introduction, which occurred at the anniversary meeting of the New York Odontological Society, January 15, 1907, in a paper entitled "A New and Accurate Method of Making Gold Inlays," published in the Dental Cosmos for November 1907.

This process, as described by Taggart, consisted in pressing into a properly prepared cavity a special wax which would burn from the mold without carbon residue; of carving this wax to contour and in occlusion: removing it by a wire, which becomes the sprue, after investing (Peck's first used) and burn-

ing out; it was cast in pure gold at the boiling-point in a special casting apparatus (using nitrous oxid and illuminating gas) known as the Taggart casting machine. Besides inlays, it is to be noted that crowns, bridge devices, and partial plates, cast in gold alloy clasp metal, were exhibited in his clinic.

Taggart: "A Cast Gold Inlay: A Clinical Demonstration and Lecture," *Items of Interest,* December 1907. In this clinic he displayed four- and five-tooth bridges cast in one piece, both against porcelain and by cementing on porcelain; a full upper plate, and one with the Gilmore attachment. In this paper Taggart's contention is thus summed up: "The actual time consumed in forcing the melted metal into the air-tight mold under the heavy pressure is probably but a fraction of a second, but the success of the whole process depends upon the speed."

He describes the gold as being "a great number of degrees beyond its actual melting-point; while it is in this freshly molded condition the pressure is maintained for a few moments in order to allow the molten gold to thoroughly congeal. Either this continued pressure prevents the gold from contracting, or the amount of expansion in the hot mold is equal to it; at any rate, the filling fits."

He concludes: "I have kept pace with all former molding processes, and find that by the time the metal is melted and poured into the mold by gravity it has become chilled enough to be thick, and not in a thin liquid form necessary for a casting; my process takes advantage of every fraction of a second."

In the discussion Taggart accentuated principally the time-saving element of the direct method, but mentioned the indirect method, suggesting an amalgam die, etc., for laboratory work.

Taggart ("Technique of Making Inlays and of Investing and Casting with the Taggart Casting Machine," *Items,* April 1908) improves his original technique by insisting on always having wax softened in water, steady temperature not above 138°F., sprue large, as sprues now go, No. 16 wire; a measuring device for proper weight of water and investment, and improved technique in mixing and flasking.

Before proceeding farther, the *cardinal considerations of pressure casting* must be mentioned, if we are to intelligently review the literature. They are, besides the question of cavity preparation in inlay work and the correct preparation of the surface to be copied in other work, the following:

(*a*) The type of wax used in the pattern, its condition and temperature when forced into and taken from the object copied and when invested.

(*b*) The investment, formulæ, mixing and refractory qualities, temperature when mixed, behavior when heated and cooled, etc.

(*c*) The various ideas as to drying and turning out the wax, of heating up and cooling the investment.

(*d*) Casting in a cold or a hot mold.

(*e*) The metal, its purity and fluidity, its temperature and alloys, its contraction, etc.

(*f*) The machine, and the way it applies its power, and the different types of power.

Indirect Method.

F. T. Van Woert.

As an exponent of one type of indirect method applied to inlays, the articles of Dr. F. T. Van Woert, "Technique of Inlay Making, by the Direct and Indirect Methods," *Items of Interest,* 1913–14, are here condensed.

After describing the two methods, the author recommends Taggart's wax and his method of softening it, as well as trimming and smoothing the wax form. His article is an argument favoring the indirect method, and he shows that a correct impression in cups original with the writer can be made by using Kerr's modeling compound with models constructed of silver and tin amalgam. He makes the same claim for accurately copying a root for crowning; insists on a small sprue, as a common pin located at

the point of greater bulk of wax pattern; also new gold for each casting, as it is seriously affected by every re-fusing. Models on an articulator are not reliable for obtaining occlusion and bite taken in Taggart's wax, like the pattern in the direct method; this can be carved to occlusion and makes possible the carving of occlusal facets. He favors casting in a cool mold, and believes large pieces are practical; is in favor of cold form when casting.

Weston A. Price.

As an exponent of another indirect method applied to inlays may be mentioned Weston A. Price, whose reports are here condensed. His method consists in "taking an impression of cavity tooth walls; contiguous tissue and approximating contact, the making of a model from this impression in artificial stone, and casting into invested model under very high pressure."

W. A. Price: "Laws Determining Casting or Fusing Results—Their Control, and a New and Rational Technique," *Items,* May 1908. In his research, Price, by a very ingenious device and the casting of bars 1 in. in length in a fused quartz box, because of the shrinkage variation of investments, reports the expansion and contraction per linear inch of gold and its alloys: "The contraction here varied unduly as compared to the expansion; for example, pure gold cast under one pressure contracted 18/1000, and under another pressure only 14/1000, and under another and very low pressure 20/1000." He concludes: "If we are to get constant results we must use constant pressure, and to secure the least contraction we must have the pressure as high as possible without distorting the investment." He then explains the relation of the

actual effective pressure, which varies through enormous ranges with some casting investments; with gas or air it is equal to the cross section of the inlay or mold, not the gate or sprue, in fractions of a square inch divided into the pressure per square inch of the gas. . . . If the cross section of the inlay is ½ in. square it will be ¼ lb. less the back pressure, which finally reduces it to less than ½ lb. actual pressure. . . . With the centrifugal machine the actual effective pressure is the weight of the mass of molten gold multiplied by the square of the velocity of the gold in feet per second, divided by the radius of the circle it moves in, divided by 32 to change poundal into pounds' pressure. . . . Half an ounce of gold revolving at ten revolutions per second, in a diameter of 10 in., will produce 2.14 lb. pressure on the inlay. With a casting machine giving 1/100 lb. actual pressure on the inlay the total contraction of pure gold will be about 20/1000, or 2 per cent.; with 5/12 lb. the contraction is 13/1000 in.; this is one-third nearer perfect fit than the inlay made on 1/100, amounting to a considerable factor in a long bridge.

Investments. Some expand and some contract, but none expand enough to correct the errors in contraction. Distortion of investment "will be small if the volume of the investment is large everywhere as compared with the size of the cavity or mold and is heated evenly and slowly; . . . a large cast must not be made in a small investment cup."

W. A. Price: "Laws Determining the Behavior of Gold in Fusing and Casting," Dental Cosmos, March 1911. *Tests of waxes:* Wax pattern 107°F. in cavity chilled to 67°F. contracts 1.2 per cent.; this error is carried forward if invested at room temperature; if heated at time of investment to 130°F. it will expand to 2.4 per cent. larger than when the pattern was in the cavity. Price claims that this enlargement will not correct the error of gold contraction (which is 2 per cent.), because it is not uniform and because of the distortion produced by the elasticity of heated wax in cooling, and proves that working the wax produces unusual distortion. Two bars of gold were cast under identical conditions from two patterns; the one of worked wax contracted 6.7 per cent. and the cast wax pattern expanded 2.7 per cent. From a long list of waxes tested, contraction ranged from 2.3 per cent. to 0.6 per cent., which is the minimum for any wax. He gives this formula for wax:

Pure white gum,	110	parts.
" tamarack,	10	"
" beeswax,	15	"
" paraffin,	10	"
" stearic acid,	1	"

He says, however, that "All of the contraction errors can be controlled by reheating when investing (there agreeing with Van Horn) if the condition of the wax is not one of internal stress or stretch," and claims that elasticity "is always active when wax is cooled under stress," which is the case in nearly all inlay wax patterns, and he criticizes the direct method of Taggart on these lines.

The setting of all impression materials shows a slight expansion—a fraction of 1 per cent., which is a negligible quantity. A very important element is the expansion and contraction of the investment material produced by burning out the wax pattern. He furnishes a very valuable table showing these changes and at what temperature the investment should be cast into, to secure maximum expansion of mold, to offset unavoidable contractions in the metal, and shows the error of allowing the investment to cool, after heating to dry out wax before casting.

Pressure of molten gold upon the investment. He proves that "The strength of investing materials when entirely cold is much greater than when hot." A table showing the Price investment as standing best calls attention to the fact that the coefficient of expansion of any investment is several hundred degrees less than that of a metal cap or ring carrying it, hence they do not sustain or support the investment.

After a thorough survey of his work (*Items of Interest,* May 1908, reviewed herein), which was only taken to the sagging-point of bars, he finds only 0.5 per cent. defect in contraction to correct as being as recorded—2.20 per cent. linear as against 2.25 per cent.; hence 6.60 volume instead of 6.65. These figures are always a fixed error to which we must adapt our technique by producing some definite error elsewhere to neutralize them. This is best done by uniformly enlarging the mold which is to receive it; in this he again agrees with Van Horn.

Price shows that if we cannot control contraction, we can control its location, and have it appear in the sprue, by having gold molten in the sprue while the inlay is cystallizing; in other words, by a larger amount of gold in the sprue in proportion to inlay, also a relatively large gate, with hot investment and high pressure. Eight ounces positive pressure on a square surface of $\frac{1}{8}$ in., equivalent to 40 per cent. pressure, moves pure gold to only 30°F. below its melting-point; 24 oz., 120 lb. pressure, moves it to 200°F. below its melting-point. These are very high pressures (see references about loss of pressure), and can only be used in strong investments, such as "artificial stone," a silicate cement originated by him—formula herewith:

Price's artificial stone.

Pure silica,	20	parts.
Calcium hydrate,	19	"
Aluminum oxid,	42	"

He claims that artificial stone is so strong that the cooling gold cannot crush it, but will itself be stretched. Gold cast into it with blowpipes drops out; with low pressure it falls loose; with high pressure it becomes necessary to split the investment. The same comparison is true, he claims, of rings cast to fit a mandrel.

Price—in "Casting to Models: Its Advantages and Technique," *Items of Interest,* September 1910—admits that gold contracts 2 per cent. or one-fiftieth of its dimensions in all directions, and states that a dental joint cannot be made by any of the present methods closer than 1/1000 in., while it should be 1/10,000 in.; hence he suggests that the cavo-surface angle be beveled in all directions and then closed by burnishing, while the inlay is setting. He opposes casting direct to porcelain, but believes in the great advantages of artificial stone in casting large pieces or copies, because of no contraction; also crowns and bridges, both in section and grouped

dummies, and partial and full plates, can be cast with little contraction.

Reasons Favoring the Direct Method.

Having briefly outlined the two types of indirect methods and produced the arguments of their prominent supporters, we turn again to some reasons why the direct method should be used.

M. L. Ward.

M. L. Ward: "A Consideration of the Casting Process, with Special Reference to Refractory Materials," Dental Cosmos, September 1909. Dr. Ward reviews the three articles of W. A. Price quoted, but does not agree that an "artificial stone" model, which expands sufficiently to counteract the shrinkage of the gold, and high pressure in casting, is necessary, nor that it will correct the evil, remarking that Dr. Price's are not the only methods pursued by engineers in such work.

Ward disagrees, first, in that while he grants the shrinkage of gold to be as liberal as deduced by Price, 2 per cent., he claims that this was for bars; he takes the wheel as more typical of the inlay, and states, from tables given, that while an iron wheel 10 ft. in diameter had a linear shrinkage of 1.08 in. per ft., one 2 ft. in diameter shrank only 0.115 in. per ft., so that castings of iron $\frac{1}{4}$ in. in diameter only shrink 0.0004 in. Accepting Price's determination for gold at 2 per cent., which is twice that of cast iron, he says: "We can only calculate a shrinkage of 0.0008 in. for pure gold; seated in the center of this cavity, this leaves 0.0004 in. of cement in each side." He further explains that "It is not necessary to counteract the shrinkage of gold in casting by high pressures and artificial stone models." Shrinkage "can be prevented beyond the limit of human errors in other parts of the technique if we cast into a dry cool mold." It is necessary to have the gold as fluid as possible, but not boiling, the mold as cool as possible, and to cast quickly (making an oxyhydrogen blowpipe absolutely necessary). (Note that this is confirmatory of Dr. Taggart's original recommendation.)

Ward emphasizes not only purity of gold, but of alloys of gold and platinum, and insists that repeated heating produces sluggishness and destroys fluidity, no matter how pure the metal.

Investments. He states that ferric oxid, a common impurity of silex in an investment, destroys the color and fluidity and raises the melting-point of all pure metals. He goes very thoroughly into the refractory substances both chemically and physically, as used in investments, and emphasizes the value of the well-known expansion of silica to counteract the contraction of plaster. He insists that the size of the flint is also important, giving the following formula for dental concrete:

No. 200 flint,	30 cc.
XXX silica,	36 "
Plaster of Paris,	17 "

(Flint to be coarser for large pieces.)

Ward reports a study of the pressure on different investments on the market, concluding that the fine ones, after heating, will scarcely hold together while being placed in the dynamometer; the coarse ones are stronger, though less uniform in change.

He emphasizes the importance of definite pressure in casting which can be maintained, and says of his formula for investment: "If these plans are carefully carried out, the movement appears to be practically nothing, the expansion of the silica counteracting the shrinkage of the plaster."

C. S. Van Horn.

A vigorous defender of the direct method is found in C. S. Van Horn, whose method ("Concerning Casting Methods and Casting Devices," Cosmos, June 1911) "consists in making a wax pattern in the tooth cavity, expanding the pattern by having the investing material and flask at a temperature sufficiently above the normal body temperature when this pattern is in-

vested, to compensate for shrinkage of the gold, which is in excess of the expansion of the investment."

In "Casting Failures and Remedies," DENTAL COSMOS, August 1912, Van Horn sharply disagrees with Price on a number of points, and particularly objects to his cavity preparation, which anticipates long beveled edges or laps in the inlay which have to be modified and burnished to cavo-surface angle adaptation, claiming that it stretches and hardens the gold; that the cement line will come up either in the finishing or in after wear to occlusal stress; and with him J. G. Lane and Van Woert agree.

Van Horn: "Casting: A Review and Commentary, Including a Technique which Makes Possible a Casting of the Same Size as the Wax Pattern at Body Temperature," DENTAL COSMOS, 1910. He favors the direct method because, first, "A cylinder of pattern wax approximately $\frac{3}{16}$ by $\frac{1}{2}$ in. when passing from normal body temperature, $98\frac{6}{10}$°F., to the temperature of the water with which we ordinarily mix our investment (54–56°F.), will shorten some $\frac{0.0001}{4}$ in." The same rule, he insists, applies to impression compound or wax methods, such as Price's, hence the impression in Price's should be expanded, as he (Price) recommends the expansion of the wax pattern. As to casting apparatus, he knows of none on the market which will give a cold mold at the moment of casting, nor of one which will allow 300–600 lb. pressure per square inch; considers it useless to so theorize, and says that while no machine is perfect, the vacuum method is the most tractable.

Van Horn: "The Wax Pattern: A Technique, Together with Appliances, etc., for Its Execution," DENTAL COSMOS, September 1912. He introduces a series of wax pattern forms which approximate the cavity formation, and says: "The scientific consideration involved is that pattern wax is very susceptible to physical effects of heat, and that advantage is taken of the difference in the coefficient of expansion of the wax and that of investing material under the same thermal influence."

His argument against the Price artificial stone method is that at its highest efficiency it still leaves, as Price admits, so much shrinkage that the cavo-surface angle has to be chisel-beveled, as does the filling, and the area of leakage has to be closed by burnishing.

"Standardizing the Investing Process and Simplifying the Casting Process," DENTAL COSMOS, October 1911: Van Horn agrees with J. G. Lane that it is anatomically impossible "to take an accurate impression of the interior of an approximo-occlusal cavity, the exterior of the tooth involved, the contiguous tissues, and a part of the approximal tooth, without distortion, unless the tooth walls be sacrificed in cavity preparation." He further argues: "Then add to this the further uncertainty of perfectly reproducing the parts in the model and of casting in the invested model under the exceeding high pressure of 300–600 lb. per square inch, without distorting the investing material which envelops the model." Van Horn has certain hard wax forms which he presses into the cavity, removes, and then covers with liquid wax kept melted in a special device (the wax softener); this to a degree compensates for the defects and gives good results by the direct method. He emphasizes again the statement that "It is absurd to assume that castings filling the cavity perfectly will result from following any process which does not provide a means of controlling and determining with accuracy the temperature at which the wax pattern is invested." Wax patterns, he says, should never be subjected to cold water while in the cavity, but always to warm water. ("The Wax Pattern," etc., DENTAL COSMOS, September 1912.)

His conclusion is that "No process, no material, and no device has yet been evolved which would produce two gold castings of the same size for the same cavity unless those patterns were invested at the same temperature."

Casting against porcelain he does not recommend, but says it can be done, provided the investment be hot enough, and submits specimens; he agrees that this field is limited.

J. G. Lane.

J. G. Lane ("Casting: A Retrospect," *Digest,* vol. xv, page 436) favors the direct method because of "only three transfers, *i.e.* cavity to pattern, pattern to investment, investment to gold." He objects to the indirect method because of its five transfers, *i.e.* cavity to impression, impression to model, model to pattern, pattern to investment, investment to gold; also he argues that there are four transfers by the "artificial stone" method, thus introducing error. He objects to impression methods because of distortion, produced by attempting to get not only the interior of the cavity, but the exterior and that of adjoining teeth; disagrees with Ward that flask should be just so cool as to be handled—it will do for small fillings; for compound fillings the flask must be as hot as possible, saying that "The lower the temperature of the flask the greater the shrinkage," and that "The approximate amount of shrinkage desired should determine the reduction of temperature in the flask at time of casting." He does not agree with others regarding expansion of investment in iron and brass rings and Peck's compound at different heats, saying: "On the Taggart and Jameson machines with brass rings it is possible to get a casting almost the size of the flasked pattern, but absolutely no larger."

Investment material, says Lane, should expand sufficiently to follow up the expansion of the brass flask which contains it. This will stand 45 lb. per square inch ("Results of Experiments," *Pacific Gazette,* vol. xvi, page 586). This investment showed best results (parts by weight):

Cast plaster,	1 part.
Powd. silex,	3 parts.

Castings made with this investment compared thus:

Peck's,	83/100	of 1	per cent.
S. S. White's,	18/100	" 1	"
Lane's formula,	16/100	" 1	"

The above were made in hot molds and again in molds with same technique and investment, and then allowed to cool so they could be held in the hand, with a loss of 1.64 per cent. by shrinkage in plaster and silica. The casting pressure for the above experiment was 25 lb. air per square inch.

Why pressure is needed during casting. Lane says (*Dental Digest,* vol. xv, page 98): "The only reason why any pressure is needed is that the molecular attraction that holds the mass of matter —the gold—in globular or spheroidal form is greater than the force of gravity, and the gold therefore will not by force of gravity flow down on the mold without assistance" (see experiments). A great objection to Price's method is distortion due to tooth contour in removing large impressions; and "For all practical purposes it is a geometrical impossibility to distort the mold should shrinkage of investment occur."

J. G. Lane: "Investments for Casting Molds," *Digest,* 1911. Plaster making up a heavy percentage of all investment always "burns smaller." He says, "A simple ocular test for any investment is, if a line of space occur on heating between investment and flask, it is sufficient cause to cast aside such investment."

Tests of investments are given (flasks all red-hot) as follows:

L. D. Caulk loss,	0.14	of 1	per cent.
S. S. White,	0.18	" 1	"
I.D.L.,	0.56	" 1	"
Standard,	0.60	" 1	"
Consolidated,	0.84	" 1	"
Peck's,	0.86	" 1	"
Terra plastica,	1.28		

He says: "It will be observed that this method of testing follows exactly the line of technique that we follow in our regular work, and the findings are not merely statements of measurements and figures, but are statements of facts as they obtain in our daily practice." The highest measurement records a loss

of approximately 1/7 of 1 per cent. by shrinkage. The investment compound represented in this particular test shows no trace of a line of space between the flask and its contents when heated to redness: the investment expanded as much as the flask which contained it." As a second test, all flasks allowed to cool down to room temperature; flasks lukewarm were exposed to oxyhydrogen flame for only twenty seconds, with the result that contraction was vastly greater than with hot flasks. The results were—

	Loss per cent.
L. D. Caulk,	0.88 of 1
S. S. White,	0.92 " 1
I.D.L.,	1.30
Standard.	1.34
Consolidated,	1.68
Peck's,	1.60
Terra plastica,	1.95

Hence, Lane emphasizes. "The importance of casting in a hot mold cannot be overestimated," and insists that "A hot mold is stronger than one that has been heated and allowed to cool." He recommends, finally: "If it is necessary to have a casting with an absolute zero measurement (or greater than that) expand the pattern by flasking it in a warm investment, according to the technique of Van Horn."

In the discussion of Lane's paper (in "Manual of Casting,") his attitude toward the artificial stone process is well outlined as follows:

While we must admit that Dr. Price has worked out a beautiful technique in theory, yet we have not been able to obtain from his writings—and we believe we have read most or all of them—certain data, or technique, that must of necessity belong, in order that his technique may obtain as he claims for it. This data is the temperature that the mold must have at the moment of casting and a means of determining that temperature. Dr. Price has ingeniously devised an artificial stone that has a permanent expansion equal to the normal expansion of gold up to its flushing-point. Granting this equalization, then any rise in temperature in the flask at the moment of casting means an increase in the size of the casting over and above zero measurement. In order to roughly demonstrate to you the effect of variation of temperature in the flask at the moment of casting, we have here a small mandrel on which are two gold rings. The mandrel has a taper of one degree, the patterns for the rings shown here were made at exactly the same point on the mandrel, both were invested in the investment material that we have advocated, and from the same mix or bowl of batter. There could, therefore, be no possible difference in physical conditions thus far. One ring was cast in a mold as hot as the fusing-point of the brass flask which contained it would allow, and the other cast in a flask that was cool enough to handle with the fingers at the moment of casting. You will notice that one ring drops to within the tiniest line of the point where the patterns were made, and the other ring stops about 3/8 in. farther up. Therefore, in order to make a given technique, complete data for the temperature of the flask at the moment of casting should be given.

The figures given us by Dr. Lodge—giving the effect of pressure as determined by Dr. Price—are in error. Dr. Price obtained these figures by experimenting in casting with a centrifugal machine.

In the same article, in the *Items of Interest*, wherein Dr. Price gives us these figures, he states that "In computing pressure in such a machine the entire mass of gold in the crucible is available and must be reckoned in computing the pressure on the sprue area." This is unquestionably an error. An inflexible law of physics teaches us that the only bulk of gold available for pressure and computation under such conditions is a bulk equal to the area of the narrowest part of the sprue opening, and the length of which is the height of gold in the crucible. All the remaining bulk of gold that fills the rest of the funnel-shaped crucible adds absolutely nothing to the pressure on the actual sprue area. Therefore all the figures that are based on this theory and method of computation are certainly in error.

From J. G. Lane, "The Casting Process as Applied to Inlays of Gold and other Dental Uses," *Dental Digest*, July, August, and September, 1909, we make the following notes:

(1) He does not favor casting on porcelain.

(2) Recommends cast gold base for loose pin crown.

(3) Recommends, in bridge work, waxing up dummy to long-pin facing or

saddle-back tooth, removing and filling holes with graphite.

(4) Opposes casting even small bridges as a whole, on account of the shrinkage.

(5) Recommends casting part of pyorrhea splints.

(6) Recommends casting pure aluminum as a full-plate base, and claims disintegration of the early work was due to impure metal; says aluminum may be cast directly against the teeth if not encircled by wax. Partial plates may be cast in gold.

L. W. Strycker.

L. W. Strycker: You are referred to his article, "Ancient Origin of Dental Casting" ("Manual of Casting," page 5) for valuable historical data relative to pressure casting. We quote him here on investments: L. W. Strycker ("Investments for Casting Molds," *Digest,* March 1911) claims that an investment which expands outwardly will distort the mold inwardly, and does not agree with Lane. Strycker insists that the micrometer test is useless in measuring inlays, saying it is not possible to make castings smooth enough to make measurements of any value in determining shrinkage. Emphasizing the importance of the location of the wax pattern in the casting ring, he says: "In vacuum casting the wax form is placed nearer the bottom of the ring; in pressure casting, nearer the top." He concludes: "As the investment material is increased in amount the expansion will be uneven, and it will be greatest in the direction of the least resistance according to the length of the material involved."

L. E. Custer.

On *investments,* L. E. Custer ("Some Practical Points on Inlays," in "Manual of Casting," page 62) objects to silex from lack of smooth surfaces; suggests plaster of Paris 1 part, fire clay (highly calcined) 4 parts. This fire clay will not shrink because it has been burned at a much higher heat than that of casting: 1 cubic in. at red heat will shrink 1/1000 in., shrinkage of inlay mold will then be one-fifth of 1/1000, or "too little to worry about." "The mold should be dried and highly heated at time of casting; when casting in a hot mold it is not necessary to have gold so hot." It is necessary to have the same pressure on the gold in casting each time, but done on compressed air, gas, or steam machine, it is better to have enough gold to seal the edges, preventing back air-leaks. In centrifugal machine have only enough to make a pefect casting and little excess, for "The mold is distorted by too great a head of metal or too high centrifugal speed." In this Custer disagrees with many.

C. J. Clark.

C. J. Clark (*Dental Summary,* January 1911, "A Consideration of the Shrinkage of the Investment: Investing the Wax Model so as to Secure Minimum Possibility of Distortion"), explains that the lateral expansion of the inner walls of the mold takes place, and says: "Therefore the lateral expansion would be of an unequal and varying degree throughout the ring, registering the same degree of irregularity upon the inner circumference of the ring, hence the inner circumference would no longer maintain the lines of a perfect circle, and the ring would be described as having become warped and the inner circumference distorted," and he displays a number of diagrams and specimens establishing these facts.

In speaking of the *expansion of metals,* C. J. Clark ("A Theoretic Consideration of the Expansion and Contraction of Gold when Cast under Pressure," see "Manual of Casting," page 9) claims that there is a vast difference between the expansion of gold in a crucible and when forced and held in a mold by air-pressure. The relative specific gravity of gold is 19.16, and casting under pressure is a combination of hydraulic pressure and welding, which develops a higher specific gravity than in ordinary cooling, thus 12 lb. pressure of expanding gas will develop a density or specific gravity of 19.45. "There is no inherent force or physical property

in the metal itself after being cast under pressure capable of augmenting its density to any further degree, so it is physically impossible for it to shrink; . . . therefore the discrepancy must be ascribed to some other factor or cause than the shrinkage of gold."

For an excellent analysis of the various machines and the methods of applying force you are referred to

C. J. Clark: "An Analysis of the Various Methods and Devices Used to Cast Metal under Pressure," *Dental Review,* August 1908. He objects to the machines using compressed air or gas, as follows:

(1) The expanding gas chills the metal.

(2) The force employed is not restricted to expend its efforts where they would be most effective.

(3) No vent for free expulsion of the confined air.

(4) Only the minimum amount of the pressure expended is utilized, the major portion being wasted by being applied where it is a positive detriment to the efficiency of the machine.

As to the *advantages of vacuum machines,* he says:

(1) The metal is not chilled by expanding gas, but on the contrary, heat can be applied until the mold is completely filled.

(2) The confined air in the mold is drawn into the vacuum chamber before the metal is forced into the mold.

He concludes that centrifugal force is the best because of—

(1) No expanding gas to chill the molten metal.

(2) No pressure penetrating the investment enveloping the metal and assisting it to shrink.

(3) The air confined in the mold and gate is allowed to escape into the surrounding investment unhampered by any opposing force.

(4) It requires no expensive or complicated machine or operation.

His objection to steam is that it is only momentary. He says: "When a wet pad is suddenly brought down upon a heated flask and over glowing metal steam is generated, a sudden spasmodic pressure is developed, but only for the instant, for as soon as the maximum heat has subsided the pressure immediately diminishes, and as this occurs a vacuum is formed and the pressure on the molten metal is *nil.*"

As bearing on the foregoing, we quote Kabell (*Items of Interest,* May 1909). He reports a series of tests to show that "The location of contraction was not affected by any pressure on the sprue and investment differently between 3 and 25 lb."

W. A. Price questions this statement (see his articles).

T. P. Hinman.

T. P. Hinman ("Technique of Casting," February 1914, *Dental Summary*) gives the result of his long study of waxes, saying that the best wax consists of white wax, paraffin, and stearin, with the following properties: Wax gives plasticity, paraffin gives firmness, and stearin gives carving qualities. This wax should be very carefully annealed in hot water after it is made; this is very important. He advocates weighing investment and water, and states that, in heating the investment, changes in crystallization take place in the plaster (the base for all investments) about one hour after mixing, and that they can be stopped by heat; therefore the drying out should begin before the expiration of that hour. After burning out the wax allow the flask to cool so as to cast in a cool mold, otherwise the inlay will be too large; employ from 3 to 5 lb. pressure for casting, according to size, kept up three minutes after casting; use 24-k. gold usually, and for contours 24-k. gold with 3 per cent. platinum.

We quote a valuable and practical procedure for *control of shrinkage* of both wax and investment in M.O.D. cavities recently reported by T. P. Hinman ("Technique for Some of the Problems in Casting," read before the Pennsylvania Society, July 1914; see DENTAL COSMOS, March 1915).

He states that it is applicable to all cavities involving three surfaces. By the indirect method a matrix of 3/1000 pure gold is burnished and swaged with enough lap to protect the cavo-surface investment and margins from breaking down, caused by molten metal being driven against it. This matrix is filled with cast wax, preventing errors of elasticity. These should be cast cool; they never need cavo-surface trimming, and can be cast in any alloy giving a pure gold margin.

R. Le Cron.

Robert Le Cron ("Remarks on Castings," *Dental Brief,* and "Manual," page 221). In prosthesis he emphasizes the importance of the size of the sprue as small and multiple for gold; any reasonable size for light metals and aluminum and aerdent alloy; and still smaller for heavy metals, as tin and Watt's metal.

This article is a most valuable contribution on vents and air-cushion in casting large pieces.

He suggests perforating the investment at distant points with fine broach and then sealing the flask end of the perforations with a little soft investment; this holds the air-cushion within, prevents heavy metals from running clear through; he emphasizes the fusing-point of metal, saying, "There is a certain condition of a molten metal at which that metal will cast to the best advantage—and it is not the boiling-point." The dangers of overheating and of carbon flame are also mentioned. He claims that thin castings covering large surfaces can be made of gold, following the rule (excepting Watt's and similar metals). "The heavier and greater the bulk of metal, and the thinner the object to be cast, the smaller the sprue opening and the greater the number of sprues radiating from a common center to various parts of the mold; and last, but by no means least, the flatter the crucible or surface upon which the metal is melted. . . . With small work the porosity of the investment should be quite sufficient (as a vent); by 'small' is meant inlays, crowns, bridges, or any design with a radius of 2½ in."

Pressure Casting of Base Plates, etc.

There is a great divergence of opinion on pressure casting of base plates, many claiming that it is practical in gold and its alloys in partial dentures, and all are of the opinion that full plates are practical when cast in pure aluminum.

Among the first to accomplish such castings were Bean and Zeller, and it is interesting to quote C. C. Carroll—who practiced pressure casting of aluminum 1885–86—to this effect: "Maintain the pressure about five seconds to give the molecules of metal time to arrange themselves under pressure, otherwise there may be small pits over the surface of the denture."

R. C. Brophy ("The Scope of Casting in Dentistry," "Manual," page 115) practiced successfully for seventeen years casting of full bases for dentures in alloys of aluminum, as aerdent alloy, but says it is not practical to cast full bases in gold; approves and practices horse-shoe partial or saddle plates.

Robert Seymour ("The Cast Aluminum Plate," "Manual," page 131) describes model made of silex coarser than for investment; 3 parts of silex to 1 of plaster; waxed up in Tenax wax; three gateways; sprue of No. 10 wire or short wax, and a special separating flask allows removal of wax without too much heating; plunger machine with moist asbestos film for casting with gentle but firm pressure; vulcanite attachment for teeth.

D. D. Campbell (Campbell's Cow-bell Method of Casting," *Dental Summary,* December 1912), for casting aluminum bases, recommends C. C. Allen's investment (equal parts Portland cement and dental plaster); casting done by tipping cow-bell on the flask in which the investment is made; spaces must be left between teeth if metal is cast direct to them. After casting the base, it is set on the die and swaged, increasing accuracy.

Harpel and Olds ("Plate Casting by Vacuum Process," "Manual," page 225). For constructing full upper and lower base, vulcanite attachment, models made of good investment compound coated with graphite to give smooth surface on the cast; four wax gates leading to the wooden sprue at the heel of the wax plate, which should be formed and carved with rim and retention lugs just as needed. Blowpipe flame not to be directly on metal; cast when fluid; flask hot.

G. H. Wilson ("Wilson's Cast Aluminum Plates," *Dental Summary,* December 1911). Models made of wash silica and plaster of Paris, equal parts by measure. Teeth waxed up with beeswax on paraffin base-plate; diameter of pouring sprue, 3/16 in.; two gates at heel of plate; casting done in Billmeyer bucket, cast aluminum not practical as applied to platinum pin teeth, because aluminum is a solvent of platinum.

There is a divergence of opinion on the practicality of casting splints in bulk because the gold does not burnish well on the edges; many agree that casting against backings or abutment fillings or crowns is feasible.

See the various articles of Herman Chayes (*Items,* February 1911, and in 1912, "Telescope Crown," etc.) for ingenious casting ideas and wonderful mechanism and casting results; as also the methods of Charles Ash (*Dental Summary,* 1913).

Herman Chayes is in favor of direct pressure; says alloys for inlays should be 5 per cent. platinum and pure gold. Believes in cast saddles, cast on direct line with the sprue and not at right angles to the section; thinks dummies should be cast and then assembled and soldered.

Pressure Casting in Crown and Bridge Work.

As one of the original and most prominent exponents of the practice of pressure casting applied to crown and bridge work, H. J. Goslee's numerous articles in the *Items* might be quoted were there time. We paraphrase from two others:

(*a*) "The Extent to which the Casting Process May Be Advantageously Applied to Crown and Bridge Work," *Dental Summary.*

(*b*) "Removable Bridge Work," *Dental Review,* 1912.

Davis crowns and Goslee teeth are stronger when cemented in than when soldered in or cast; he says the color is better, and is opposed to direct casting upon porcelain.

Bridges, fixed. The copes of abutments for fixed bridges, together with the dummies, may be made by casting again a 36-gage pure gold swaged to amalgam die of root.

Gold crowns (little contour) he suggests that cusps be cast into 28-gage 22-k. to gold band previously fitted and contoured; for extensive contour, narrow band of 22-k. gold or platinum 30–32 gage fitted cervically, then gold cast upon that.

In making dummies, casting separately preferred; when cast in section must never be more than three or four.

Backings for Goslee teeth 24-k. 38-gage, are always best swaged to porcelain teeth before casting, to insure accuracy.

Facings used in the same way; contour and narrow saddles for cleanliness. Recommends uniting dummies by 22-k. solder, as against practice of casting in 5 per cent. platinum-gold alloy and uniting with pure gold.

Bridges, removable. Opposes the casting of clasps because it weakens and destroys resilience; much better made of rolled or drawn metal. Recommends Roach, Morgan, and Gilmore attachment and notes the great possibilities in casting for forming the body of any fixture, saying that—"The successful casting of large pieces means development of proper technique." High-grade investment and strong properly stiffened wax forms; in this way, he says, "All forms and sizes of saddles may be cast, and coin gold is especially adapted, for it is sufficiently strong and accurate."

Casting Directly on Porcelain.

The subject of casting directly on porcelain is open to debate, and few can be found who believe it practical.

W. A. Sanderson, "Porcelain Crown with Cast Gold Bar," "Manual," p. 14, says: When investing, add extra wire opposite sprue, which is withdrawn with sprue to allow escape of gas or air; this allows casting to thin edges on porcelain. There must be no excess wax nor overlap on porcelain, and investment should be heated as high as possible.

W. C. Gillespie ("Casting, with Special Reference to Casting on Porcelain," "Manual," page 217) claims that porcelain is never checked by casting directly to it without backing; metal used 24–22-k. gold; no flux necessary. The ring, investment, and porcelain in the mold should be at a red heat; emphasizes the importance of careful waxing and investing.

The following men claim to cast on porcelain successfully: E. M. Carson, St. Louis, "Clinic on Cast Crown," Cosmos, April 1912, p. 453; A. J. Bush, "The Cast Inlay and Its Advantages," *Summary,* February 1914, who prefers cold to hot mold, and metal white-hot and 24-k. gold. A few other well-known authorities who claim it is practical: W. G. Crandall, "Manual," page 107; Cunningham, "Casting Gold on Porcelain," page 122: W. H. Hayden, "Casting Large Bridges," page 126.

A conservative majority, however, are opposed to casting direct to porcelain, as illustrated by Thos. E. Weeks ("The Possibilities of the Casting Process in the Use of the Various Manufactured Porcelains in Crown and Bridge Work" *Dental Brief,* June 1911), who is opposed to casting on porcelain, and suggests to cast dummies individually, cementing on porcelain later, and he recommends platinum wire where casting has extra stress.

Cast metal bases for molars, etc. Any number of articles might be quoted relative to the various applications of the cast metal base for molars, bicuspids, canines, or incisors. The work of Goslee has been quoted; a few others are—

G. S. Schlegel, "An Ideal Bicuspid or Molar Crown," "Manual," p. 111. C. J. Burris, "Cast-Jointed Logan Crown," "Manual," p. 80. C. J. Lyon, "Jackson's Method," *Dental Review,* 1913. F. W. Haslett, *Dental Summary,* January 1912. T. C. Hutchinson, "Making a Richmond Crown Without Use of Solder," "Manual," p. 129. J. M. Thompson, "Description of an Interesting Case, Restored by All-Porcelain Bridge and Bridges upon Cast Bases," "Manual," p. 157. G. E. Stallman, "A New Attachment for Abutments in Bridge Work and Porcelain Crown, etc.," *Items,* April 1911.

The Metals Used in Pressure Casting, and Their Alloys.

All expert operators unite in opposing the use of scrap gold for any sort of pressure casting, and a majority are for pure gold for inlays, as C. O. Simpson ("Making the Most of the Casting Question"). Many agree with Gillette (*Summary*) that platinum and gold 2½ per cent. is the best for stress areas. Others think, with C. N. Thompson ("Experience with Cast Metal," *Review,* December 1910), that contour inlays should be platinum 1 part, pure gold 24 parts.

The following prominent operators who believe the indirect method the only one for restoration of perfect occlusion, reproducing planes, facets, and sulci, are also in favor of a lighter platinum alloy to maintain those lines: J. Lowe Young, R. Ottolengui, Henry Gillette, W. D. Tracy, F. T. Van Woert, and T. P. Hinman (see reports).

Mr. Weinstein's Report.

We append the valuable report of Mr. Weinstein, whose laboratory, so far as the reporter can discover, has done many successful large castings. He remarks on casting large pieces in gold:

"Comparatively little of this work has been done generally, for lack of not only apparatus, but of proper gold alloys.

The ordinary golds obtainable, such as 18- or 20-k. or coin gold, are all too soft when cast into large thin sections. Clasp metal, which may be anything from 14-k. gold very high in copper to 16-k. gold high in platinum, has proved unreliable on account of brittleness, etc. For the last four years I have used for this purpose the two following alloys—(see B and C). These two alloys are identical in tenacity and hardness and other general properties, as will be shown later. Their contraction in the cast form is lower than pure gold or platinized gold, and they make castings of satisfactory density and rigidity without brittleness.

The tables given below were worked out, he states, and will explain the procedure in developing the formulæ:

CASTING GOLDS: FORMULÆ.

(A)

(Soft for inlays, etc.)

Nitrous oxid or ordinary blowpipe.

Pure Gold, 60 to 90 parts; Plate No. 2, 10 to 40 parts, according to hardness desired.

Color and fusing-point approximately the same as pure gold when low percentage of No. 2 is used.

(B)

(Maximum hardness for casting sections of bridge work, partial dentures, etc.)

Nitrous oxid blowpipe.

Pure Gold,	80.0	parts.
" Plat. Rhod.,	8.5	"
" Palladium,	3.5	"
" Silver,	2.0	"
" Copper,	6.0	"
	100.0	

Fusing-point about 50°F. higher than pure gold.

(C)

(Maximum hardness for casting sections of bridge work, partial dentures, etc.)

Gas and air blowpipe.

Pure Gold	80.5	parts.
" Plat. Rhod.,	6.5	"
" Palladium,	2.5	"
" Silver,	2.5	"
" Copper	8.0	"
	100.0	

Fusing-point approximately same as 22-k. gold (Cu, Ag Alloy).

These alloys may be remelted and recast without perceptible deterioration. No flux is required when making the actual cast, but a flux of a reducing nature should be used when melting up residue buttons for future casting. Potassium nitrate or similar strong oxidizing agents should never be used in connection with alloyed golds, for the simple reason that they oxidize just the elements it is desired to retain in a reduced metallic state and not in an oxidized state.

As a general proposition, large pieces should be cast in sections and united with solders of corresponding fusing-point and color. A long, narrow saddle or section or a plate can be cast better vertically than horizontally. One sprue, 14 or 13 gage B. & S., is ample, as the shape of the pattern becomes a continuance of the sprue, and the molten metal drops directly into the cavity (mold), and therefore in the line of least resistance. This applies particularly to casting long thin sections, and this method is more certain than where the sprue or sprues are placed at right angles or nearly so to the pattern.

It is essential to have a perforation in the flask base of the casting apparatus so that the air cannot be compressed in the mold. This is a very frequent cause of failures in casting, particularly with pure gold.

He says of *sprues* and *pressures:*

Sprues 14 gage to 13 gage B. & S. are generally advisable. From 7 to 9 lb. air-pressure is sufficient for inlays, sections of bridge work, saddles, etc. When very small inlays are to be cast the pressure must be increased to 12 or 13 lb., especially if the size of the sprue is decreased to 17 or 18 gage B. & S. Multiple sprues are hardly necessary except in some rather rare instances, and it is not advisable to attempt to cast several inlays in one flask.

In casting pure gold it is essential to use a small sprue and not too large an excess of gold, for the reason that pure gold retains heat much longer than alloyed gold, has a very strong tendency to globulate in a spheroidal form, and, if the excess is large and superheated and the sprue large, the tendency is for the uncongealed residue button to draw the casting toward it and consequently either a separation of the sprue occurs or rounding of the margins of the inlay, or both.

Weinstein makes the following notes on the properties of alloying elements, which are reproduced because they vary from the accepted usages:

Au, Ag. Contraction approximately same as pure gold (not more).

Au, Cu. Contraction less than pure gold.

Au, Pt. Contraction more than pure gold.

Au, Pd. Contraction approximately same as pure gold (not more).

Silver does not increase hardness of gold (distinctly contrary to all works on dental metallurgy).

Copper increases hardness of gold approximately two and a half times as much as equal per cent. by weight of platinum.

Platinum does not alloy uniformly with gold if over 10 per cent. is used.

Rhodium. 10 per cent. Rh, 90 per cent. Pt, is used instead of pure platinum. Makes better alloys.

Iridium. Not used. Absolutely detrimental. Segregates and makes uneven alloy.

Palladium. Alloys perfectly, increases fusing-point more than Pt, and is used to partly replace Pt and make more uniform alloy. More than 5 per cent. has strong decolorizing action, and is therefore not advisable.

In discussing the advisability of a *hot* or *cold mold,* he says:

At the present time, owing to improvements that have been made along the line of wax, investment compounds, etc., the cold flask is unquestionably indicated, except possibly in the case of "pick-ups" (contoured pieces, as a post of wire, etc.). It must be understood, of course, that the terms hot and cold flask are only relative, because with the usual casting methods in use, when the operator begins to melt his gold, a very hot flask will cool down considerably and a very cold flask will heat up considerably. Consequently, the difference in temperature between the so-called initially hot or cold flask is not nearly so great as may appear at first sight.

Investment materials and *wax patterns* he reports on as follows:

The refractory compounds for casting process available now are superior to those obtainable at the time Price's artificial stone was introduced, and while the Price's method may have some advantages over the amalgam die method for inlay work, I cannot find any other particular application for it. The investment compounds that contain graphite leave a good deal to be desired, on account of the difficulty of making *a dormant aqueous mixture* of graphite, silica, plaster, etc.

The investment compound should not *contract* at all under any conditions, but should expand slightly so that it is absolutely tight in a slightly expanded casting ring. It is essential that it have this property, because we have not only the uncontrollable contraction of gold to contend with, but also the contraction of the wax from the time any pattern is formed until the investment is set around it, consequently any shrinkage of investment should be avoided.

An *expanding* soldering investment is essential. This matter has been completely neglected, as if there were no such thing as contraction in bridge work. It is unnecessary to repeat the investigations of Van Horn on this subject, as he has covered this fully. He is essentially correct on all points, and it is absolutely impossible to cast an inlay with any satisfactory degree of accuracy *unless the principles laid down by him are followed.*

Weinstein admits that it is possible to cast direct to porcelain, but believes it is not practical, and that the majority of operators are opposed to it because the contraction of the metal is ten times that of porcelain.

EFFICIENCY OF DENTAL SERVICES AND DENTAL RESTORATIONS.

By F. R. GETZ, D.D.S., New York City.

(Read before the Academy of Stomatology of Philadelphia, at its monthly meeting, February 16, 1915.)

I ONE time overheard the remark that the profession of dentistry was not only restricted and narrow, but also that a man became as narrow as the area in which he worked. The speaker may have based his remark on both subjective and objective impressions, and he may have been justified to a certain degree.

In so far, however, as the problems of any profession are a part of its opportunities, no dentist can complain of not having had chances to broaden after entrance into general practice, by going over the borders of the conventional limits of established beliefs and methods, without fear of dire results or of his fellow practitioners' condemnation, as long as he obtains and can show consistently good results following his efforts.

One of the first essentials for rendering work of any kind a success is a really active interest therein, a compelling desire to do and master the task in hand, by giving as much care and attention to the unpleasant and difficult as to the more agreeable parts, and the most careful attention to details and minutiæ. A critic once said of a painter that his genius was nothing more than infinitesimal attention to details. That assertion is just as true in relation to every other art or science.

Not all can hope to be geniuses, but that does not relieve us of the obligation to recognize that, in our work of keeping conditions in the human mouth healthy, and of improving and correcting them when abnormal or pathological states have become temporarily established, a greater responsibility rests upon the general practitioner today than ever before.

With the improvement of methods, instruments, and appliances, and the lessening of mental and physical strain for the operator, there has been going hand-in-hand a proportionate decrease in the pain and severity of operations for the patient; but with all of this has come also a general broadening of the work and the responsibilities of the dentist in his relation to the patient and to the general health of the individual, in the care of the mouth from infancy, through youth to adult development, and through the prime of life to senile old age. It is with this long series of physiological and anatomical changes that the several branches of our work, with their diversified special problems, have to deal.

This scope may appear to be narrow, but its length, ramifications, and importance in relation to the general health of the individual amply compensate for lack of width.

Speaking from the viewpoint of general practice, I believe that one of the most important facts to be borne in mind in all dental work is that no condition or set of conditions in the mouth is absolute and without relation to concomitant conditions and to some other states that normally follow. The changes following each other both in health and disease are so well established and generally so regular, that the general practitioner of dentistry is under obligation to his patient to give full recognition and consideration, not alone to the immediate but to the remote effects of his

recommendations, advices, and services. Services rendered without foresight and without the intention to give service are a poor return for the patient's confidence and money. I believe that there are degrees in all things, and that it is impossible to obtain ideal results when necessary limitations thereto naturally exist.

SCOPE OF PAPER.

In applying some of the foregoing remarks to actual practice, it is not so much something new as a new viewpoint or added emphasis on familiar conditions and their treatment that I wish to bring forward in connection with the idea of efficiency, particularly in the crown and bridge division of prosthetics.

In speaking of crown and bridge work, the word *practical* is used almost universally by the profession, but I have never been able to acquire a clear conception as to just what is meant and popularly understood by that term, unless it be to designate that artificial substitute for the natural organ which will afford the greatest relief and service for the longest period, with the least interference with the normal conditions of the natural organs.

In the care of a mouth in its entirety, it is rather difficult to draw a line sharply defining crown and bridge work from operative practice, and it is just as impossible to consider it without taking into account orthodontia requirements or the prevention or treatment of pyorrhea arising from malocclusion or other causes.

To be a little more definite, let me compare the practical value and efficiency of some of the most commonly seen forms of crowns and bridges, and point out their faults and advantages in relation to the rest of the teeth and to the whole mouth, bearing in mind particularly the idea of conserving the crowns and roots of the natural teeth.

DISADVANTAGES OF BANDLESS PORCELAIN CROWNS.

Speaking of crowns first, I would say that the bandless porcelain crown gives a most pleasing artistic result, but its bad features more than offset this single good one.

Every pin in single crowns that I have ever had to drill out, at one time supported a bandless porcelain crown. Most old perforations and most split roots have been associated with this type of crown. The pins are necessarily large, and necessitate a lot of reaming for length and thickness to accommodate them. In the upper lateral incisor roots this is particularly fraught with danger; most of the split roots observed have been those of lateral incisors. It is so difficult to produce by grinding a good adaptation of the base of the crown to the root that necessarily, in the large majority of the cases, cement fills up the irregularities. Inevitably, sooner or later this dissolves or breaks out, subsequently exposing the pin to the continual stress of mastication, until finally granulation of the metal and breaking result. I have made the same observation with the platinum base burnished to the face of the root.

There are other instances where the root when exposed by recession of the gum becomes infiltrated, discolored, and infected, which has also a poisonous effect on the cementum and gum, no doubt in this way also hastening the otherwise normal recession.

Only recently I removed a long, broad pin from an upper central incisor. The crown had broken just two days before the patient was to enter the hospital for a serious operation. Of course that meant disarrangement of appointments over two days, and much work that was not provided for.

Two days afterward another patient presented for consultation, having been referred by her physician on account of a bad condition of the gums around a fixed bridge on the upper left central and the upper right lateral, supplying the right central. The abutments were of the cast-base, bandless type. A radiograph showed that the pin in the lateral root was perilously near or actually through the distal side of the canal wall, and that absorption had taken

place. A radiograph is an assistance, but a single one is not the last word in diagnosis, so the condition could not be correctly diagnosed without another picture, which was not taken at that time. The central root, which contained a broken-off pin, had never been extracted but was hidden under the bridge, which was set close to the gum.

It was a beautiful restoration when regarded from the front, but it will be a dear one for the patient. The right central had evidently carried a bandless crown which was broken off; it was subsequently left just as it was, and the lateral root was included in the scheme. I am citing these two cases as the most recent illustrations of the many bad results and situations that are in large part avoidable. "Robbing Peter to pay Paul" does not pay in dentistry. Would it not have been better to use a banded crown in the beginning in both of these cases and others like them?

ADVANTAGES OF BANDED CROWNS.

The difficulty of constructing the banded crown and the visibility of the band after a time are the two main objections to its use, but these are more than offset by its other, good features of strength and protection of the root. I have never yet had to dig out the pin of a banded crown of my own or a *confrère's* make because of its breaking.

It is contended by some general practitioners as well as specialists in the treatment of pyorrhea, that the banded crown irritates the gum. This is true of a band which is not properly fitted, but it is not true of a well-fitted band. On the contrary, it reduces poisoning and irritation, because it is a non-absorbent, non-conductive surface, to which the slimy, filmy deposits characteristic of mouths in which recession and softening occur do not readily adhere and therefore are not present to poison the gum. In cases of pyorrhea where pockets have been formed, and the necks and roots of the exposed teeth have become softened above the gum line, conditions are improved and the life of the teeth is lengthened by banding them to a point under the margin of the gum; after that the denuded root portions under the gum are freer of deposits than before. Softening occurs almost always above the gum line and almost never below, even when the root is denuded to some extent.

There are other features in favor of the carefully made banded crown. In all porcelain crowns, the band is readily removed, in case it becomes necessary to use the root for bridge anchorage.

Porcelain facings with gold cusp and backing can be readily modified without removal, if they are to serve as abutments for removable bridges held in place with clasps and support lugs. I have, on occasion, made these with the lug support prepared and temporarily filled until the time when they would be required to serve as bridge supports.

What applies to the bands of porcelain and porcelain-faced crowns applies also to the all-gold or shell crown. I never place a gold crown on a vital tooth either singly or as a bridge abutment. Pulp extirpation and root-canal filling is not always the pleasantest work, but it is far less objectionable than the evil conditions that sooner or later follow the capping of a vital tooth.

I would not claim that the filling of a root-canal removes all possible subsequent root troubles, but it reduces them to a minimum. To say that root-canal work is always and uniformly successful would be an affront to your intelligence. I have kept very accurate records of my treatment of these old canal conditions, and the percentage of cases of trouble originating from the pulps of capped vital teeth, and from teeth in which presumably the root-canals were not investigated before crowning, is very large. The trouble is that when a vital tooth dies subsequent to crowning, with a grumble that subsides without an abscess, the dentist is reluctant to cut into or to remove the crown, and the patient is unwilling to have it done; so the spark goes smoldering on.

There is a style of bridge anchorage

which still appears very frequently, but for which there is little excuse as an intended permanent appliance in the code of good dentistry of today. It is the open-face crown. It should be classed among the obsolete appliances in dentistry.

GOLD INLAYS AS BRIDGE ABUTMENTS.

In regard to inlays as abutments for fixed or removable bridges, I contend that, disregarding exceptional cases, a cast gold filling or inlay in a vital tooth will not support a fixed bridge. The only secure anchorage of an inlay abutment of a fixed bridge is a pin in the canal or pulp chamber, inserted, whenever possible, in such a way as to make it readily removable in the event of another form or more extensive prosthetic restoration being needed in the future. When using an inlay in a molar, for the purpose of supporting one end of a removable bridge, it is not necessary to devitalize as frequently as in the case of the smaller bicuspids.

The inlay is used to better advantage in yoking and fixing pyorrheal teeth than in anchoring long spans of fixed bridge work.

PRESERVATION OF THIRD MOLARS FOR BRIDGE ABUTMENTS.

My attitude toward the third molar is one of respect. After ten years of experience I am even more unwilling to condemn one of these teeth, even though they be troublesome, than I was earlier in my practice. Though in some cases these teeth do not erupt well earlier in life, and under certain conditions extraction becomes imperative, they more often can be carried along until years later, when they may be made most serviceable for anchoring bridges, either fixed or removable, after the other molars have been lost. By a conservative estimate, the proportion of these molars is 20 per cent. of all the teeth that I have used for bridge abutments. To render them serviceable for the longest period means careful root-canal work, which, of course, necessitates the use of the rubber dam. Adjusting this on the third molar is in many cases a most troublesome procedure, yet there are but few cases where it cannot be done.

The building up to serviceability of a third molar that has been decayed or broken down to the gum line is not a joy, but it can be done, and is well worth while if the root is well-anchored and firm. In these teeth, which are so irregular in shape and taper rapidly from a very large crown to a stubby or curved root, trimming and band-fitting is rather difficult, in addition to the difficulties of devitalization and canal work.

In using third molars as abutments for removable bridges with clasps and inlay for bridge lug supports, I more often devitalize these teeth than the other molars.

PROCEDURE IN EXTENSIVE BRIDGES. THE QUESTION OF EXTRACTION.

In more extensive cases the details of crown and bridge construction are the same as in individual teeth, or very short bridges consisting of one or two teeth. In cases in which extensive losses have been sustained, much recession has taken place, and some or all of the remaining teeth are loosened and irregular, it is my habit to devote considerable time to a study of the conditions while devitalizing and treating the abutment teeth, or those to be yoked together in the pyorrheal cases. The first important step consists in the removal of all teeth and roots that are hopelessly beyond saving, so that absorption of the alveolar bone may take place in preparation for the saddles. In considering the extraction rather than the retention of loosened teeth it is best to be guided by the state of the gums around the teeth. If one or two of them are in very bad condition and the rest are fairly good, it is better to extract the hopeless ones at once. They are only a menace to the adjoining teeth in better condition, and I would not under any circumstance retain a root that is a menace to the health of the patient. Nursing along too many wabbly teeth adjoining sounder ones is like too many cripples on the right of way—they are not getting on very well themselves and are hindering the progress of everybody else.

On the other hand, if the condition of the individual remaining teeth is about the same, if the patient is willing, and these teeth are not a menace, I am inclined to strengthen and retain them, and the results obtained in some of these cases are surprisingly good and gratifying in the extreme.

However hopeful and sanguine we may be, we must not for a minute believe that either investigation, or science, or oral prophylaxis, or improved treatment of pyorrhea, or orthodontia, are going to save the sons and grandsons of the dentists of today from the necessity of dealing with these extensive cases and from making prosthetic restorations for the purpose of continuing the usefulness of loosened teeth and of replacing lost ones.

The interval between the loss of the first of the permanent teeth and the time when only the last one remains, taxes all the dentist's resources to postpone to the latest possible date the making of restorations that are held in place only by suction or gravity.

CONSERVATIVE VS. RADICAL PROCEDURES.

The maintenance of normal occlusion, and equal stress upon all of the teeth is the condition most to be desired. Two main factors must be considered in restorations: first, keeping the rest of the teeth in place, and secondly, restoring the function of the lost members. These factors are more important than consideration of the preservation of an individual tooth, and while I am opposed to the removal of pulps from perfectly sound teeth, if this alone stands in the way of carrying out a larger scheme for the benefit of the whole mouth, I do not hesitate to extirpate.

In many of the smaller cases, where pyorrheal conditions do not exist it is possible to make restorations without any mutilation, but in very extensive cases for patients advanced in age it is not only necessary but beneficial to extirpate the pulp and prepare the tooth for the type of attachment desired.

While radical when the conditions call for thorough methods, I am nevertheless strongly opposed to taking extreme measures in instances where more conservative types of appliances will serve more satisfactorily and can be used as an intermediate step.

Soft tissues of the body may be bruised and torn, and the tissues will heal or replace themselves. It is not so with teeth, for every particle of enamel or dentin that is disintegrated by caries, worn away by erosion, or cut away in making restorations, must be and can be replaced only by the artificial substitution of a material foreign in nature to the tooth substance. Therefore, in making restorations of lost or non-erupted teeth, I am strongly inclined to the use of such forms of appliance and attachments as will leave the sound tooth in its most natural state.

CLASPS.

Properly made, strong but flexible clasps serve this purpose admirably. I have from time to time shown models constructed after this principle, and have been a little surprised at the questions asked and the objections offered. Without going into details, I would only say that the use of clasps in bridge work is one of the most conservative measures in the care of a mouth, particularly early in life, with the prospect of the fight against wear, age, and disease of the teeth and gums.

Of the many types of attachments that are made today in private practice and by the trade, none are universally and satisfactorily applicable to every case and condition. It is for the operator to determine which is the best attachment for each individual case so as to guarantee the longest and most satisfactory service.

To sum up, the thought which I have tried to convey is that in all restorations, in the operative as well as the other branches, and particularly in crown and bridge restorations, it is possible and imperative to exercise discrimination and to be judicious in the choice of appliances and methods of attachment, in order to make crown and bridge work practical.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE INTERRELATION OF THE TEETH AND THE EYE.

By WM. T. DAVIS, M.D., F.A.C.S., Washington, D. C.

(Read before the Dental Society of the District of Columbia, April 20, 1915.)

IN deliberating on this subject let us consider for a moment the anatomy of the nervous system of interest in this connection. The fifth or trifacial nerve supplies both the teeth and the eye with sensation. Its motor root supplies the muscles of mastication. Most interesting is its connection with the other cranial nerves and the different ganglia by branches of communication.

ANATOMIC CONSIDERATIONS.

The fifth is like a spinal nerve in that it is a mixed nerve, *i.e.* having motor and sensory fibers. Its deep origin (sensory portion) is from a tract in the medulla which is continuous with the substantia gelatinosa in the cord. Thus irritation of its peripheral fibers may cause dilatation of the pupil from irritation of the cilio-spinal center in the cord, which presides over pupillary dilatation. The deep origin of the motor root is from the floor of the fourth ventricle and aqueduct of Sylvius. Here are also the deep origins of the third, fourth, sixth (motor nerves of the eye) and the ninth, tenth, eleventh, and twelfth.

Can impulses other than efferent be transmitted through motor nerves? The third, fourth, and sixth are motor nerves, but it has been shown that they contain sensory fibers, of a sort, which are connected to the sensorial nerve-endings (muscle spindles). Thus, reasoning by analogy, we assume that efferent impulses are transmitted via these nerves, third, fourth, and sixth, from a squinting or otherwise strained eye to the center or ganglia of the fifth, resulting in this strain being felt as pain in certain branches of the fifth, among them the dental branches. That is to say, irritation or strain of the motor apparatus of the eye may cause pain or other discomfort in the dental branches. There is of course no reason why irritation of the sensory fifth at the eye may not be referred to its dental branches.

Considering now the sensory part of the fifth: The ophthalmic division is purely sensory, and supplies the globe of the eye, lacrimal gland, the mucous membrane of the eye and the nasal fossæ, and the skin of the brow and forehead. It communicates with the third, fourth, and sixth, and the sympathetic. Irritation of its fibers might therefore cause irritation or inflammation of the ocular or palpebral conjunctiva, or the cornea, with consequent pain, lacrimation, photobia, blepharospasm or corneal ulceration, pain in or spasm of the muscles of the brow and forehead. As an instance, supra-orbital neuralgia. By its communications with the third, fourth, and sixth nerves, irritative spasmodic states may be induced in the muscles supplied by them, leading to muscle imbalances and more particularly to interference with the function of accommodation and convergence. Here we have a large field for more thorough investigation. Literature is replete with such cases, but only a few here and there—no large series of cases carefully and scientifically worked out.

Those motorial functions of the eye having to do with accommodation, convergence, and binocular vision are governed by exceedingly complicated

nervous processes which are as yet far from being understood. These functions are under the control of the motor oculi, abducens, and trochlearis. These nerves are in close connection with the fifth, both at its origin, its many branches of communication, and through the various ganglia. Thus, irritation of the branches of the fifth may very seriously interfere with these functions. There is little doubt that such interference takes place more frequently than we have heretofore observed. *Per contra,* may not disturbances of these functions of the eye of themselves cause reflex irritations in the branches of the fifth?

OCULAR DISTURBANCES DUE TO DENTAL IRRITATION.

It would be well to observe and ascertain how often this is true. I have observed in my own work numerous cases where the accommodation was interfered with—inability to use the eyes for near work with comfort—due to faulty accommodation; either insufficiency of this function, or spasm, the former being the more frequent. In spasm of this function we have a condition simulating myopia; one finds not infrequently patients wearing a minus glass and having much discomfort, and on thoroughly paralyzing the ciliary muscle with atropin we find they in reality need, not a minus, but a plus glass, thus proving the ciliary muscle to have been in a state of tonic spasm. This condition usually results from overuse of the eyes, *i.e.* from long-continued irritation of the nerve. That this same condition would arise from irritation from the teeth cannot be doubted. As to the function of convergence and divergence: This function is not thoroughly understood; by some it is thought to be controlled by special cerebral centers(3); by others of authority this is doubted. Suffice it to say, the ophthalmologist not infrequently finds a disturbance of this function causing severe symptoms such as vertigo, dizziness, inability to use the eyes for near work, varying from total disability to only slight discomfort. In many of these cases we exert every effort to relieve the condition, including operations on the muscles. In some cases we cannot get results. In these cases I have found many which clear up on having some dental irritation remedied. And this is a great boon to these patients. They suffer intensely and often have their efficiency markedly impaired because of it. Where we can ascertain and obtain a cure we have done a great good. The ophthalmic division communicates with the terminals of the facial; thus reflex irritation of the facial may be caused, with consequent spasmodic condition of some of the facial muscles. This division of the fifth also gives off the long ciliary nerves which supply the iris and cornea. The ophthalmic ganglion opens up great possibilities of reflex irritations from the dental branches. The sensory root of this ganglion is from the nasal branch of the ophthalmic division of the fifth, the motor root from the third or motor oculi. Thus we see how *direct* is the path between these two nerves—one the nerve of sensation of the teeth, the other the motor nerve of the eye. The short ciliary nerves go, in company with the long ciliary, to the iris, ciliary body, and cornea. And according to Gray a small branch passes into the center of the optic nerve with the arteria centralis retinæ. If this be so, it means that possibly there is some sensory function by the fifth in the retina. It thus renders probable dental irritation as a cause of retinal hyperesthesia, photobia, and exhaustive conditions of this organ; or, conversely, inflammatory conditions of the retina reflexly affecting the dental branches. These are things which we must study together; it is a new and fallow field. The neurologist, the dentist, and the oculist must needs work out this very interesting and practical problem.

The superior maxillary nerve is the *principal* communication between the fifth and the facial. Its anterior superior dental branch sends branches to

the nose; its palpebral branch supplying the lower lid, skin, and mucous membrane. These fibers are here joined by fibers from the facial, forming the infra-orbital plexus. The fifth further communicates with the seventh through Meckel's ganglion, the geniculate ganglion, and the otic ganglion. The lingual branch of the inferior maxillary is in communication with the glosso-pharyngeal.

THE MOUTH AS A FOCUS OF INFECTION.

Mayo(4) says that the portals of entry into the body by bacteria are numerous; they may enter through the sound skin. A poultice of staphylococci on the sound skin has produced a carbuncle; bacteria may enter the bile duct from the intestine, but the greater part of the pathogenic organisms entering the body do so by way of the mouth. He says 80 per cent. of the pyorrhea cases can be cured by treatment. Since his article was written, the discovery that pyorrhea is in most cases apparently an amœbic infection of the tissues, and that emetin is a specific, must have increased the percentage of curable cases. Before the amœba was recognized as a cause, it was of course rather a hopeless task to try to cure an amœbic infection when it was unrecognized. I well remember, and the memories are not pleasant ones, the terrible sufferings of our soldiers in the Philippines in the earlier days of our occupation of those islands when we had not become educated in the treatment of intestinal amœbiasis. The pathological lesions of the intestinal walls were terribly destructive; and so it must be in the mouth in cases of long-standing infections. Mayo goes on to say that there is more than a casual relation between tonsillitis and appendicitis. Murphy of Chicago states that every type of non-traumatic inflammation of the joints is a metastatic manifestation of a primary infection in another part of the body. Here then we have some of the most prominent men in medicine in America dwelling upon the importance of a nidus of infection in the system, and it is agreed by all that the mouth is the important avenue of such infection. We have conditions here which apparently are unimportant, at least have not been recognized as important until of later years, and yet which will drain constantly into the body toxins or pathological organisms. We have in the eye certain low-grade subacute inflammatory conditions of a very serious nature resulting from such a toxemia, viz, keratitis, conjunctivitis, eczematosa, etc., which may have the most serious results on the organ. The most important, however, are those involving the uveal tract, as iritis, chorioiditis, chorio-retinitis, etc., and as a result of the involvement of the uveal tract, cataract, glaucoma, optic neuritis, and atrophy. One cannot imagine a more formidable array of diseases of the eye.

EXAMPLES OF OCULAR DISTURBANCES DUE TO ORAL INFECTION.

McWhinney(5) mentions a case having blurring of the vision and mild optic neuritis due to an abscess at the root of the lower first molar. Another case, in which it was impossible for the patient to use the eyes for near work owing to insufficient accommodation. Careful and persistent ocular examinations failed to relieve the trouble. Blood, urine, and other laboratory findings were normal. Casual examination of the teeth revealed nothing. An X-ray, however, revealed an abscess at the root of the lower left canine, evacuation of which relieved the eye condition. Bruner(6) mentions a case of uveitis and scleritis, with iritis and involvement of the cornea. There was much pain extending over a long period. The condition was due to a number of teeth having been badly crowned, with resulting infection. He also mentions a child who showed a strabismus every time a tooth erupted. Another who had a severe blepharospasm due to a physiologically erupting tooth; incision over the tooth immediately stopped the spasm. The irritation from dentition

in young children may be a cause of abscess or ulcer of the cornea, both very serious conditions. An important factor to be borne in mind is that the patient may be unaware of dental trouble, and so may the dentist, unless a most careful examination be made with the X-ray.

THE TONSILS, TEETH, AND EYES.

Wright(7) says there are important relations between the tonsils and the teeth; the tonsils become physiologically enlarged during dentition—first at two years, with the first group of deciduous molars, then at six years with first permanent molars, and again at twelve years with the second molars. Now, if these glands are removed, the other lymphatic structures of the neck have to take up their function, which is supposedly concerned in the absorption of the teeth—with the result that organisms or toxins are taken into the system, with resulting involvement of the uveal tract and other structures of the eye. It is not necessary to have an actual infection in the delicate tissues of the uveal tract to cause a destructive inflammation; no more than infection is necessary in the disabling chronic arthritis and so-called rheumatic diathesis. These conditions we now know to mean slow continuous absorption of toxic material into the circulation. Some of these toxins have special affinity for one tissue, some for another. Some of the commonest causes for chronic oral infection from teeth are imperfectly fitting crowns, badly banded teeth, poorly filled root-canals, incomplete asepticizing of the canals, perforation of the apex by instruments, undiagnosed root-abscess, dead pulps, apical infections, and dead teeth.

GLAUCOMA AND DENTAL NEURALGIA.

Ackland(8) mentions two cases of glaucoma causing dental neuralgia! Glaucoma is a condition which may present very few or no symptoms apparent to the untrained eye and yet may exist for years. The attacks may occur from time to time and be entirely referred to the dental nerves or other branches of the fifth. The attacks come on suddenly and without warning, and the pain might be referred to the dental nerves without any apparent connection with the eye. I have seen one case that was treated for years for supposedly gastric attacks and which was only acute exacerbations of a chronic glaucoma. This condition should certainly be borne in mind when the dentist has to deal with intractable neuralgias supposedly of dental origin and which do not yield to treatment.

IMPACTED TEETH AND OCULAR REFLEX DISTURBANCES.

Macmillan(9) mentions the fact that impaction of teeth is a prolific cause of reflex disturbances—impaction of the lower third molar, in particular, due to its proximity to the inferior dental nerve. There are formed about its root successive layers of cementum, hypercementosis. This causes pressure upon and continual irritation of this nerve, with consequent referred symptoms. We have seen the paths via which such reflex irritations travel. Trismus may be present, due to irritation of the motor portion of the fifth. Various facial anesthesias may occur due to the involvement of the sensory portion; also, in this connection, loss of the muscle sense in the ocular muscles. This leads to grave kinesthetic disturbances which in the eye muscles are of the utmost importance, as it is intimately concerned in equilibration, determining our position in space, estimation of distance, the height and size of objects. Interference may also take place with the lacrimal and nasal secretions. The importance of peripheral irritation is becoming recognized more all the time. Instances of mental disturbances are mentioned(10) as a result.

ASTHENOPIA AND OTHER OCULAR DISTURBANCES DUE TO ORAL SEPSIS.

Harder(11) mentions the cases of asthenopia that come to the oculist and

receive careful attention, and yet fail to get relief. A certain percentage of these cases are certainly due to dental trouble, infection, toxemia, or reflex irritation. He mentions particularly the general ill health which may result from the chronic intoxication; as malaise, slackness, feeling of inefficiency. These we easily recognize as symptoms of a toxemia. Rheumatism, myalgia, arthritis, neuritis, brachial and sciatic, being the commonest. He says there is scarcely any eye disease which may not be caused. In this connection it is interesting to consider the possibility of sympathetic ophthalmia having a dental origin. To date we have found no adequate explanation of the cause of this truly dreadful disease. By some authorities it is thought to be of reflex nervous origin, by others an infection. On either of these hypotheses we might seek an explanation from dental infections or irritations. Harder goes on to say that dental sepsis may be the result of (1) dental caries, (2) periodontitis, (3) dead teeth. Dead teeth are particularly apt to cause infections such as chronic inflammation of fibrous tissues and serous membranes, due to the salivarious strain of streptococci. It it not necessarily the amount of toxic material in the mouth; the amount absorbed is the important point. Thus a foul mouth may have very little absorption and an apparently clean one a great deal from a single infection. Special attention should be given to the examination of the gums; look for soft spots, patches of congestion or blueness, minute pouting sinuses, broadened or thickened alveolar processes—all these being the results of chronic inflammation. After such an examination, including the X-ray, all being found apparently normal;—if the patient is suffering from chronic ill health and all other causes of this condition can be eliminated, then, if there be present a dead or crowned tooth, one is justified in removing them or one of them and making a test for the presence of the infection. Vallow[12] says tuberculosis may be caused by carious teeth; the bacilli being harbored there, get into the system by way of the intestinal tract. He states that the tooth pulp has no lymphatics—and this is a fact, but the tissues about the apex are rich in lymphatics. Thus we have near at hand an avenue of infection from a caries that may penetrate the pulp, form an apical abscess or necrosis, and so involve the lymphatic system.

Rosenau[13] says there are two great avenues of infection of the human body by the tubercle bacillus—one the respiratory tract, the other the gastro-intestinal tract. The latter he considers the more usual route in children, and in the bone and joint forms of tuberculosis. Blair[14] says that in pyorrhea, destruction of the peridental membrane of all the teeth to the depth of one-eighth inch from the gingival border will leave an exposed chronically suppurating surface of from $2\frac{1}{2}$ to 3 sq. in., from which not only is there absorption of toxins, but also the pus is swallowed. When the periapical tissues become involved in caries, he says, there ensues a gradual absorption of bone, a chronic bone abscess, which may persist years without local symptoms and thus be of greater menace. The pericemental membrane is elastic. During mastication there is a pressure on the teeth, or a single tooth, of from 10 lb. to 250 lb. If one of these teeth projects into an abscess cavity it acts as a plunger, forcing the infection into the lymphatics or injured places in the vessel wall. In the presence of certain chronic toxemias such as Hg, Pb, As, Bi, P, and syphilis, peridental infections are apt to light up widespread infections, such as Ludwig's angina or Holtz phlegmon. Carious teeth, too, are undoubtedly the point of entrance of the mycoses.

Bruner[15] mentions that when the accommodation is disturbed from reflex irritation, it is usually a monocular condition; so a difference in the accommodation of the two sides should at once put us on our guard. Abscess of the orbit may result from dental infection. I have observed in the eye clinic at the Episcopal Eye, Ear, and

Throat Hospital, in this city, a number of cases of abscess within the sheath of one of the ocular muscles. All of these patients had bad teeth. I am inclined to assign this as a cause.

CARE OF THE DENTIST'S EYES.

The foregoing inadequately describes a few of the conditions with which we as head specialists have to deal. Much more might be said, for it is a wide and very interesting subject. Enough has been given, however, to invite our attention to it. Let us all study and observe and then report in literature what we observe, and so add to the *summum bonum* of our knowledge on this subject.

Before closing, a few words as to the care of your own eyes: I know of no profession, unless it be my own, where such long-continued strain is put on the eyes. Here, as in all branches of our profession, prophylaxis is the word—the "safety first." Do not wait until the eyes are worn out before seeking aid from a competent ophthalmologist. Listen to the warning words of Black([16]): "Care should be observed in arranging light for your office. No cross lights—not too much light. The latter produces weariness of the eyes from long-continued contraction of the pupil, and also from retinal irritation." I would advise all to re-read this chapter if you have not done so lately. It is good advice.

The reason your eyes are on such a strain is because you are during your working day looking at objects close to your eyes. This calls into continual play your accommodation. Now, without going into the complicated mechanism of the accommodation, suffice it to say it is a muscular action and consequently grows tired just as with any other muscles. Now, if you have a refractive error, this puts a very heavy burden on the eye. If you have ever done any long-distance walking you know when you start out in the morning fresh and rested, a pack on your shoulders weighing several pounds is nothing—you don't know it is there! But as the hours pass, and mile after mile lies behind you, you begin to notice it, then to weary, and finally to feel you cannot carry that few pounds another yard. Now this is just the condition of the ciliary muscle—the muscle of accommodation. You do not feel a refractive error at first, but you do more and more all the time. The weight the ciliary muscle is carrying grows heavier and heavier. It would be the part of wisdom for you to consult your oculist once a year—just as you have your patients come to you once or twice yearly to prevent trouble.

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STANDARDIZING OF OPERATIONS AND METHODS IN DENTAL DISPENSARY PRACTICE.

By F. W. PROSEUS, D.D.S., Rochester, N. Y.

(Read before the union meeting of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York, at Buffalo, November 19, 1914.)

ATTENTION is called to this subject, not because considerable care and much thought is not being given to it at present, but with the hope that this paper and its discussion may bring forward such methods as, if adopted, would improve the work of the dental dispensary.

During an experience of several years with this class of work, the writer has had opportunity to evolve certain practices and methods giving him excellent results in regard to the saving of time for the operator, the number of individual patients cared for, and the permanence of the work in cases where it was possible to carry the individual to the age of self-support.

Examination and diagnosis. As the examiner or operator notes the general condition of the patient and the oral cavity, is he to confine himself to the necessary dental work? Shall we examine the teeth and proceed to clean, fill, treat, or extract without considering how such procedure may affect the ultimate results? Or shall we make a selection of cases, and classify them for definite procedures in operating? For instance:

If we select the children of the public or parochial schools as they enter the lower grades, and put the mouth of each child in a healthy condition, the ultimate result will be much more beneficial than if we do dental work for the higher grades and are not able to attend thoroughly to all the children who need care.

The late Captain Lomb, whom we might call the father of oral hygiene in the public schools of America, desired the children of the eighth grade of the Rochester public schools to be given preference, as he reasoned that they were just entering upon their life-work, and if they were to be efficient and healthy, should not suffer the handicap of bad teeth. His idea was excellent, but unless all children can be cared for, I believe better results can be accomplished by entirely ignoring all other children until those newly entered or registered in certain grades have been given attention, and the dental work which they need has been completed as far as possible. This method the writer adopted at the state industrial school, and he had the satisfaction of seeing the girls' department and the third division entirely cared for in two years. Previous to adopting this procedure, the worst cases were selected, and there was an endless mass of difficult cavities, exposed pulps, and abscesses always ahead of the dentist.

In adopting certain practices for the guidance of the operators of the dispensary, the best selection of methods and remedies should be made by the directors, regardless of their individual preferences. The following is given, not as a set standard, but simply in order to illustrate the foregoing suggestions.

Cleansing the teeth. Many cases present an excessive deposit of tartar, which after removal leaves the gums in an inflamed and bleeding condition, which interferes with the rapid and thorough cleansing of the teeth. Should further attention be required, time would be gained by dismissing the patient and

completing the cleaning at the following visit.

Extracting. When necessary, an anesthetic should be used in cases which require the removal of large roots or teeth. Careful judgment is imperative in this procedure. The extraction of the permanent first molar in the developing jaw should be seriously considered, and in many cases avoided, even though the treatment of such teeth consumes unreasonable time. Roots of the upper anterior teeth especially should be saved, and their space preserved. The treatment of devitalized teeth and the filling of root-canals is a tedious operation, but it is often of importance to the development of the whole masticatory organ, and the difficulty of the work is partly compensated for by the width of the root-canals in young mouths. While it would not be practical to follow the procedure of some of our illustrious operators in this operation, it is possible to select a material suitable for putting the canals in a sterile condition and for filling them satisfactorily so that in later life the patient may have an opportunity to select further means for the permanent care of a tooth thus treated.

Filling the teeth. Whenever possible all material should be permanent, according to our conception of the word. No phosphate cements are permissible when they can be avoided; all fillings must be contoured and polished when the patient returns. Anterior teeth with large or small cavities are to be filled with amalgam lined with cement, and stripped smooth at the following visit. Silicate fillings are indicated in certain cases, but permanence of the work is to be given preference to esthetic effect.

Each patient's work should be finished in the least number of visits possible, thereby avoiding unnecessary repetition in the sterilization of instruments and the operator's hands, the number of teeth treated to be given preference to the number of patients treated. When teeth present fissure and approximal cavities, as many of the simpler ones should be filled as possible, and at the same visit those teeth which need treatment should be opened up, and a dressing of a definite character, which will be a guide to the operator at the following visit, should be applied.

Malocclusion and irregularities. Cases in which extraction is not advisable should be cared for immediately whenever possible, or the parent's special attention should be called to the condition.

All cases which are doubtful regarding the extraction of teeth and roots, or cases of malocclusion, in which the patient or parent are to be advised, should be referred by the operator to the board of directors, or those in charge of the dispensary's methods of operating.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

DENTAL CLINICS IN MANILA.

By LOUIS OTTOFY, D.D.S., Manila, P. I.

PREVIOUS reports of these clinics have been made as follows: To April 1, 1910 (see DENTAL COSMOS, August 1910). To April 30, 1911 (*ibid.,* October 1911). To July 30, 1912 (*ibid.,* November 1912). To December 31, 1913 (*ibid.,* May 1914).

There are at the present time three regularly organized dental clinics in operation in Manila: At the Philippine General Hospital, at St. Paul's Hospital, and at Bilibid (federal) Prison. In the accompanying tables, under the head "Other Institutions," the work ac-

DENTAL OPERATIONS PERFORMED IN THE VARIOUS DENTAL CLINICS OF THE CITY OF MANILA, P. I., FROM MAY 1, 1905, TO DECEMBER 31, 1914.

(*Under the charge of* LOUIS OTTOFY, D.D.S., *Manila.*)

	St. Paul's Hospital.	Philippine General Hospital.	Bilibid Prison.	Other Institutions.	Grand Total.
Treatments	9,324	12,015	1,634	2,654	25,627
Extractions	6,986	2,946	1,212	308	11,452
Amalgam fillings	393	301	3	1,595	2,292
Cement fillings	435	100	31	612	1,178
Gutta-percha fillings	462	93	14	291	860
Gold crowns	422	121	53	3	599
Bridges	252	28	17	1	298
Cleaning cases	89	93	16	48	246
Vulcanite dentures	148	3	7	3	161
Porcelain crowns	97	7	1	. . .	105
Gold fillings	38	11	2	. . .	51
Vulcanite dentures repaired	5	. . .	. . .	. . .	5
Richmond crowns	4	. . .	. . .	. . .	4
Regulating cases	3	. . .	. . .	. . .	3
Prosthetic noses	6	3	. . .	. . .	9
" upper lips	1	2	. .	. . .	3
" eyes and part face	. . .	2	. . .	. . .	2
" lower lip	1	. . .	. . .	. . .	1
" ear	1	. .	. . .	. . .	1
Fracture of mandible, treatment	. . .	1	. . .	. . .	1
Obturator, cleft palate	. . .	1	. . .	. . .	1
Total	18,667	15,727	2,990	5,515	42,899

SERVICES RENDERED IN THE VARIOUS DENTAL CLINICS OF MANILA, FROM MAY 1, 1905, TO DECEMBER 31, 1914, INCLUSIVE.

Number of Patients served.

St. Paul's Hospital	8013
Philippine General Hospital	5029
Bilibid Prison	1498
Public Schools	940
St. Luke's Hospital	336
Girls' Orphanage	73
School for the Deaf and Blind	18
Home of the Holy Child	14
Total	15,921

Race.

Filipinos	15,517
White	279
Chinese	74
Japanese	26
Hindus	12
Negros	7
Syrians	4
Turks	2
Total	15,921

Sex.

Male	10,636
Female	5,285
Total	15,921

complished at the School for the Deaf and Blind, the public schools, the Home of the Holy Child, St. Luke's Hospital, and the Girls' Orphanage, is included. The clinics in those institutions were established temporarily—that is, until the inmates had been cared for—except in the public schools, where the work was abandoned on account of lack of funds; it is hoped that during the year some arrangements will be completed to reopen the clinic.

During the year 1915 the propaganda work will be begun in the public schools, with the delivery, in various cities of the islands, of the lecture on "The Care and Use of the Human Mouth," prepared by the National Mouth Hygiene Association's public lecture service, and illustrated with thirty-six stereopticon views.

Aside from the clinics reported on in this table, some dental services are rendered in other institutions of which no report can be secured. They consist principally of extractions, and such service is given free to the poor in the various stations of the Bureau of Health, at St. Luke's and other hospitals, and also at a clinic in part supported by the local dental society.

The clinic established in the Philippine General Hospital in August 1912 is rapidly assuming important proportions. It may not be generally known that this hospital ranks as not only the leading institution of its kind outside of Europe and America, but is equal to many of the leading hospitals found anywhere. Its free dispensary is visited by more than 80,000 patients annually. The dental clinic alone was visited by more than 2300 during 1914, and 5000 since it was opened.

The clinic at St. Paul's Hospital is barely self-sustaining, the small fees received for a few gold crowns, bridges, and vulcanite dentures making it possible for a young man to devote his time to the clinic, helping himself by doing mechanical work for dentists. The one at the General Hospital is supported by the government, and was just about to pay its own way, when, in order to conform to other clinics of the institution, dental service such as for which a moderate charge could be made was abandoned, and at present the work is limited to extractions, treatments, and plastic fillings only.

The clinic established at the prison is visited once a week by my assistant from St. Paul's, and is very much appreciated by some of the unfortunate inmates—who, however, happen to have moderate means, or friends outside who supply them with some money, and so are able to have some dental work done, and thus save teeth that otherwise would be completely lost during their confinement. There is a well-fitted dental room in the hospital of the prison, equipped with a first-class chair, dental engine, cabinets, etc. During the week some of the hospital stewards extract teeth and give relief. Of these cases no data are available for this report.

It will be noticed from the tables that the beneficiaries of these clinics are almost exclusively natives, less than 500 out of 15,500 patients being of other nationalities—whites (including Americans, Spaniards, French, Germans, Portuguese, etc.), Chinese, Japanese, Hindus, Negros, etc.

In the table of operations performed, attention is also directed to the prosthetic facial work of these clinics. They include a number of noses, lips, eyes, an ear, and a cleft-palate obturator.

THE TREATMENT OF PYORRHEA ALVEOLARIS AND ITS SECONDARY SYSTEMIC INFECTIONS BY DEEP MUSCULAR INJECTIONS OF MERCURY.

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and
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SINCE the publication of our former papers—as noted at the end of this paper—on this subject, we have continued to obtain the same brilliant results as previously reported. Including the twenty-two cases recorded cured in the April number of this journal, we have now, April 11, 1915, treated fifty-six cases, with 100 per cent. of cures, and not a single recurrence.

No treatment advocated for this disease has given results which can compare with these; yet more and possibly greater things can be claimed for it, for among these fifty-six cases were a number which presented systemic infection in all probability secondary to the pyorrhea, as follows: Three cases of acute infectious arthritis (so-called acute rheumatic fever), eighteen cases of chronic infectious arthritis, one of chronic gastritis, one of chronic bilateral facial neuralgia, one of chronic laryngitis, one of chronic otitis media, and one of severe lumbago, or 46.42 per cent. of the total number of cases treated, all of which were completely cured. In addition, two had gonorrheal arthritis; these were also cured. Another had syphilitic arthritis (Wassermann test 4 plus); in this case the pyorrhea was cured by four injections in sixteen days, but the syphilitic arthritis was decidedly worse (Wassermann 3 plus). The patient was then transferred to the hospital. Following the first injection of 900 mgm. neosalvarsan the arthritis disappeared, and the Wassermann test became negative.

The high percentage of arthritic cases in this series is due to the fact that these men first reported for treatment of so-called rheumatism, and the pyorrhea was detected when search was being made for a local focus of infection.

Before commencing the treatment of pyorrhea—based on Wright's theory that mercury is the chemical affinity of all the vegetable parasites—we formulated the following hypothesis:

(1) In the treatment of pyorrhea, deep muscular injections of mercuric succinimid properly administered should result in the cure of a majority of the cases.

(2) Not only this, but they should also cure any secondary systemic infection that might be present.

(3) Any co-existing disease of vegetable parasitic origin, not related to the pyorrhea in any way, should be benefited, and under certain conditions cured by the treatment.

Any treatment that successfully meets the exactions of the above surely merits the term "cure."

We believe our results previously and herein reported amply fulfil the requirements of each of the articles as set forth above, and demonstrate the correctness of the theory upon which they were based. The longest period of time required to effect a cure was 41 days, the shortest 4 days, the average 17 days. The greatest number of injections required to cure the primary infection in any one case was 7, the smallest number 1, the average 2.96.

The diagnosis in each case was based upon classical and unmistakable symptoms and conditions. Pus was present in every case, the presence of slight pathological changes in gum tissue or of any particular organism not being considered as diagnostic.

By cure we mean the total disappearance of pus, the gum becoming normally pink, hard, and firm, the filling-in and obliteration of pockets, and the firm fixation of loose teeth when the alveolar processes have not been absorbed.

When the pockets have not been obliterated and loose teeth become fixed by the time the pus has disappeared and the gums have regained their normal condition and appearance, they will quickly do so without further treatment, provided proper care be taken to keep them clean. Where a tooth socket has disappeared by alveolar absorption, it is of course impossible for the tooth to become fixed.

Further proof of the value of this method of treatment is contained in a paper by Act. Asst. Dent. Surg. G. H. Reed, U.S.N., which appeared in the April number of the *Items of Interest,* in which he described the results of treatment in a general way, and cited two severe cases in more or less detail. In a letter recently received from him, he states that up to April 1, 1915, he had treated twenty-nine consecutive cases at the navy yard, Boston, Mass., twenty-eight of which were completely cured, while the twenty-ninth was markedly improved, when the ship to which the man was attached sailed on a cruise, preventing further treatment and cure.

One of these had furunculosis, which cleared up during treatment, as did a case of chronic nasal catarrh of many years' standing.

In conclusion we invite attention to the absolute necessity for the active and intelligent co-operation of physician and dentist, if the best results are to be obtained.

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INVESTIGATION OF ENDAMŒBA BUCCALIS.

By ERNEST STURRIDGE, D.D.S., L.D.S.Eng., London.

THE striking coincidence of the simultaneous and independent discovery of *Endamœba buccalis* in the contents of pyorrhea pockets by Drs. Smith and Barrett of Philadelphia and Dr. Chiavaro of Rome led me to undertake the investigation of this subject, which I commenced shortly after hearing Dr. Chiavaro's paper in Paris last August, where I also had the privilege of seeing the beautiful stained specimens of amœba exhibited by him.

During the past eight months I have examined a great number of specimens of pyorrhea pus, and after familiarizing myself with the methods of detecting the protozoa, have kept accurate records of cases microscopically examined. I also engaged the services of experts in the Laboratories of Pathology and Public Health, where I gained much experience and was afforded great assistance in the work.

The method adopted was to transfer

the specimen from the mouth into a drop of warmed normal saline solution on a slide, the slide being kept at proper temperature over a warm water bath until transferred to the heated stage of the microscope, after placing a coverslip over the specimen. A few specimens were colored with a trace of fuchsin added to the saline solution. The presence of amœbæ was only recorded when definite amœbiform movement was detected.

The number of specimens examined and recorded was fifty. In thirty-nine of these, active amœbæ were found; eleven were doubtful or gave negative results.

The material was obtained from patients in every stage of pyorrhea, and taken from deep pockets in some instances, and often from the gingival trough when there was no sign of pus, but simply an inflammatory condition. In some cases the disease had been previously treated and the general condition was good, requiring simply a good clean up. I was astonished to find how constantly amœbæ were to be found in these latter cases.

The action of emetin hydrochlorid was tried in ten cases, and the effects carefully noted. The drug was used from ampules, the strength being ½ gr. in 1 cc. solution; it was introduced into the pockets or gingival trough by hypodermic needle.

The first and second injections seemed to produce little effect, or else a slight irritation of the gums; but after the third, improvement was noted. In cases where visible pus was present it diminished gradually after each application.

Careful cleansing and instrumentation was carried out at the same time, and in some bad cases a weak solution of iodin was used, as advocated by Dr. Barrett. After three to five treatments with emetin, I re-examined the scrapings from the positions first examined, and in nearly every case I failed to find endamœbæ. The disappearance of the protozoa did not indicate that anything like a cure of the disease had been effected; the clinical appearance of the gums indicated a slight improvement, but not more than should be expected from cleansing and ordinary local antiseptic treatment. The emetin treatment was discontinued after three to five applications in each instance, and the cases completed by my usual method of treatment by ionization with zinc ions. It may be said that the tests were insufficient to form a valuable opinion of the real action of the drug, but I did not feel warranted in prolonging experimental treatment on my patients which from clinical evidence so far was not as effective (in my judgment) as ionic medication. I am accustomed to see the pus disappear and the tissues regain their normal appearance much quicker when ionized.

I re-examined many cases (in which I had found amœbæ) after treatment by ionization alone with zinc chlorid, and found in every instance that amœbæ were not present; and I am convinced that the electrolytic action of the antiseptic drug has the effect of destroying endamœbæ.

I am not aware that ionic medication has been tried before for the destruction of protozoa, but abundant evidence is available of the antiseptic properties of certain ions when introduced into septic tissue. Leduc, Lewis Jones, Finzi, Morton, and many others have demonstrated the penetration of ions, and the antiseptic properties of such ions as zinc, copper, silver, mercury, etc. Lewis Jones recently published the first book* on Ionic Medication in which the therapeutic value of drugs applied by this method has been fully chronicled. The same author has pointed out that in the passing of ions into the tissues they penetrate the very protoplasm of cells. In my book on "Electro-therapeutics" I stated that† "The ions are deposited in the tissues; they penetrate the protoplasm of cells, and radiate in all directions. The effect is a local sterilization of an area of infection which cannot be

* "Ionic Medication," by Lewis Jones.

† "Dental Electro-therapeutics," by Ernest Sturridge; page 246.

reached in any other way." It can be readily conceived that protozoa of the size of endamœba buccalis would not escape the electrolytic action of the current when applied to pyorrhea pockets, and antiseptic ions would be conducted into their substance and they would easily be destroyed. This conclusion is supported by microscopic evidence (as already stated) in cases re-examined after treatment by ionic medication.

In the study of the pathology of pyorrhea we cannot eliminate the action of pathogenic micro-organisms. In every specimen of pus from pyorrhea numerous varieties of bacteria are found, and by the addition of the new scientific research, endamœbæ are also found. According to the conclusions of Chiavaro, "The endamœba had no pathogenic action; on the contrary, as it feeds on bacteria, it is probably an adjuvant to the auto-disinfection of the mouth." According to pathologists pus is produced by the action of micro-organisms. The therapeutic action of emetin in the treatment of pyorrhea appears to be of great value, judging from the encouraging reports published from time to time during the past nine months; but here I venture to issue a warning note, and that is: We are hardly in a position to judge the ultimate therapeutic value of a drug on a disease like pyorrhea after the lapse of so short a time. After five years, or even two years, of constant observation we might venture a definite opinion. If the buccal protozoa have a pathogenic action in pyorrhea, we may well expect great things from the use of emetin; but so far this has not been proved, and any form of treatment that disregards the pathogenic action of bacteria is likely to be palliative rather than curative.

Long-standing cases of pyorrhea are frequently accompanied by constitutional disturbances, including different forms of alimentary toxemia; to what extent amœbæ may be responsible for some of these toxemic effects we have yet to learn. It seems likely, however, that the intestinal juices would have an ingestive action on oral protozoa, as on pathogenic micro-organisms.

The conclusions I have been able to draw from the research undertaken so far are—

(1) Endamœba buccalis is to be found in the pus of all pyorrhea cases.

(2) It is almost uniformly found in soft deposits about the gingival trough of incipient pyorrhea cases.

(3) Endamœba is not likely to have any pathogenic action.

(4) Emetin hydrochlorid has the property of an amœbacide.

(5) Amœba is destroyed by the electrolytic action of the current in the passing of antiseptic ions with 3 to 5 M.A. current.

(6) Ionic medication accomplishes the dual effect of destroying endamœba and pathogenic micro-organisms at the same time.

A BROAD CONSIDERATION OF THE PRINCIPLES INVOLVED IN FIXED AND REMOVABLE BRIDGE WORK. THE PARALLELISM OF ABUTMENTS AND ATTACHMENTS, AND INSTRUMENTS FOR OBTAINING THE SAME.

By HERMAN E. S. CHAYES, D.D.S., New York City.

(Read before the union meeting of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York, at Buffalo, November 19, 1914.)

IN order to provoke virile antagonism I shall begin this paper with the following statement: Bridge work as it is taught and as it is at present generally understood and practiced is a failure from every point of view. This is a very sweeping statement, and requires substantiation in order to be generally accepted; yet all I shall have to do to substantiate my statement is to call on some of my fellow practitioners and ask them to produce their scrap-heaps of bridges removed by them from the mouths of their various patients at different times.

FAILURE OF CROWN AND BRIDGE WORK.

Would it not be a curious sensation for some of us to recognize in the scrap-heap of a fellow practitioner a piece of our own handiwork, placed in the mouth of a patient some years ago with such perfect assurance that it was the right appliance in the right place that we were almost willing to write a paper about it, singing its praises and advocating its use. Some years later this patient in his trouble seeks the services of another practitioner, who, in his efforts to relieve the patient of pay and pain, removes the vile and ill-smelling contrivance placed there some years ago, and replaces it with one of his own make, equally as good but somewhat more extensive, and of course somewhat more expensive. This goes on in regular sequence until the last few roots have been gently but efficiently dislodged from their legitimate bed, and the patient's mandible and maxilla present the smooth, rosy appearance so favorable for the adaptation of complete dentures.

If it were possible to obtain all the evidence of failures of bridge work and crown work from all the dentists engaging in this broad field, what an eloquent piece of evidence could I command to substantiate my statement that bridge work is a failure from every point of view!

No number of so-called comfortable bridges, fixed or removable, can bring about the justification of the entire system so long as these failures are unexplained, and the only way in which they *can* be explained is the fact that the so-called successes are failures, disguised as such by the tolerance by the human tissues of the abuse heaped upon them in our misconception of their requirements.

THE MOUTH AND TEETH IN HEALTH.

Any piece of bridge work may be broadly defined as a dental operation. Any dental operation may be correct or incorrect, and a correct dental operation may be defined as one the result of which is conducive to the health of the individual upon whom the operation was performed. "And we understand under the term 'health' the maintenance of that vital balance which is expressed by the normal functioning of all organs which compose the human body."

The teeth as organs of incision, prehension, mastication, and as accessories

to vocalization, viz, speaking and singing, have varied functions to perform. To render them best suited for this task, nature has caused them to acquire, in the process of their development, certain qualities and certain definite structural shapes. Any deviation from their macroscopic normality and their microscopic organization causes a lack of functional efficiency and interferes with their contributory efforts toward the maintenance of vital balance, hence all dental efforts should be directed toward a restoration of macroscopic and microscopic efficiency of these organs when they require attention.

In health, the teeth and gums, in fact all organs in the animal body, perform their function as a matter of grateful exercise without undue consciousness on the part of the animal, and contribute to the maintenance of an efficient organization in which the income is greater than the expenditure to obtain this income; but in order to obtain such a condition, we must have perfect interplay of all organs making up the animal body, and the first requisite for perfect interplay is absolute lack of interference by one organ with any other organs.

We have had our lectures in the anatomy of the teeth, and we know or we should know what they look like. We have had our lectures in physiology, and we know what the gums and adjoining structures look like in a healthy mouth; we have likewise been able to learn the beautiful lessons of occlusion. All these studies should have given us a picture of healthy conditions not easily erased, and it is this picture which we must ever seek to re-create, not *en masse* only, but in detail, considering the individual teeth and their surrounding gingivæ.

Attention is called to a remarkable realization which must come to all who would concern themselves with human-error-correcting endeavor. Every molecule making up the human or animal or plant body is in a state of constant rhythmic motion, which stands in definite geometric relation to the motion of the molecules neighboring it, which warrants the conclusion that the molecules influence one another by their rhythmic movements to the point of causing corresponding geometric gyrations in each other.

This is, of course, not a matter of first causation, that is, of life inception, but rather a matter of life maintenance, by virtue of the maintenance of equilibrium.

If we conceive the animal as a delicate clock or watch, for example, we may obtain a concrete illustration of the interrelation of all the organs. Let us assume that we are accelerating the minute hand of a clock by slowly rotating it to the right. We can readily understand that we shall by this act influence the entire mechanism to accelerated motion, and that this motion will stand in definite relationship to the intensity of the accelerative force, and that there will be a definite rhythmic and geometric relationship between the motion of each separate piece of mechanism which makes up the whole of the clock. Removing the influence of the accelerative force, an immediate rhythmic and geometric adjustment takes place, and the hands of the clock proceed to travel at the original speed. This may be called a stimulating interference with the mechanism, and results in a greater amount of work being done or activity shown in a given time than the apparatus was intended for.

If we place the hour hand at the numeral 9 and the minute hand at the numeral 3 and suspend a minute weight from the extremity of the hour hand, we shall have an inhibitory interference with the mechanism resulting in a given amount of energy doing a smaller amount of work than the apparatus was intended for; the spring will uncoil or attempt to uncoil at the same ratio, but its effect upon the wheels, and through these upon the hands, will be less marked than before. Again there will be a rhythmic and geometric readjustment between the various parts of the clock and another readjustment to normal when the inhibitory interference is removed.

Up to a certain point, these experiments may be repeated without impairing the inherent resilience of the spring,

but as soon as the point of impairment is reached, a rhythmic readjustment becomes impossible, a lack of perfect interplay manifests itself, resulting in a heedlessness of expression, the parts interfere with one another, and a great deal of energy is expended to bring about a result which is as unsatisfactory as it is unreliable.

For the purpose of elimination of mechanical shock to the nervous system during mastication, and for the purpose of enhancing the vibratory effect produced during vocalization, be it singing or speaking, also for the purpose of minimizing mechanical injury to the teeth themselves, the latter are held in their bony sockets through the intermediary agency of an elastic membrane, which is so disposed beneath and around them as to fairly hold them suspended in a resilient cushion.

The elastic fibers composing the membrane dispose themselves longitudinally, diagonally, transversely, and circularly around the teeth; they interlace with the periosteum and with the gum tissue, and thus, during the exercise of dental function, they effect an increase of circulation in the surrounding parts, which constantly brings fresh nourishment to these terminal tissues.

FACTORS INTERFERING WITH THE NORMAL FUNCTION OF THE TEETH.

The very structure of this elastic membrane and its peculiar function precludes the possibility of abundant blood supply, and makes it a ready prey to inhibitory interference. Such inhibitory interference may be brought about by impaction of foods in the interdental spaces, and by the accumulation of the calcific material known as tartar, either upon and around the neck of the tooth or upon portions of the root. The impaction of food into the interdental spaces may be caused by the malrelation of the adjoining teeth—malocclusion—or by the improper restoration of approximal surfaces of teeth calling for dental attention. An inhibitory interference may also be brought about by a break in the continuity of surface upon a tooth in the region mentioned. A tooth may be filled or crowned, and a portion of the filling material may have been left extending beyond the margin of the cavity, or the crown may extend away from the gingival circumference, pressing on the surrounding gum tissue.

If pressure be exerted upon any one or two teeth in the mouth, this pressure will be transmitted to all the surrounding structures, and through them to all other teeth, in a series of rhythmic waves or undulations of varying degrees, changing the physical outlines and surrounding structures in every direction. Upon the cessation of the pressure, a rhythmic and geometric readjustment will take place in these tissues, and a return to a condition of comparative rest—equilibrium—be obtained. Where there are no inhibitory interferences, that is, where the relation of the teeth is correct as to position and condition macroscopically, these pressure-induced waves or undulations may take place *ad infinitum* with beneficial results, because under a correct condition, intermittent pressure is the essential stimulating interference inducing an increase of circulation, bringing with it a fresh supply of nutriment essential to life maintenance.

When inhibitory interferences are present, that is, when the relation of the teeth is not correct as to position and condition macroscopically, each pressure exerted upon the teeth during mastication causes the same series of waves and undulations in the soft tissues surrounding them; but each wave or undulation causes these tissues to come in contact with injuring or bruising obstructions, and the rhythm or recoil or readjustment is first interfered with and ultimately destroyed.

Food débris, overhanging fillings, ill-fitting crowns, incorrect bridges, fixed or removable, open cavities, calcarious or calcific and soft epithelial deposits, may all be classed as inhibitory interferences with the free and unhampered undulating and very essential excursions of the soft tissues surrounding the teeth. All of them produce states not conducive to the health of the individual, and are therefore incorrect dental conditions;

and any dental operation which will entirely eliminate them will be an operation conducive to the health of the individual, and therefore a correct dental operation.

All tissues must be exercised, or rather they must have the freedom to indulge in such exercise as they need, and all tissues of all organs need exercise to keep them from undergoing atrophic changes. Hence anything that will interfere with the free and unhampered undulations of the gum tissue, by any means whatever, will result in pathological conditions by bringing about, first, a lethargic state in the tissue; second, a diminution in vasomotor action, because of lack of re-stimulation; third, an accumulation of waste material in the cellular and intercellular substance resulting in a rapid death of cells, and fourth, an atrophy or loss of tissue resulting in a physical change which renders it difficult to maintain a hygienic balance.

THE FUNCTIONS OF ABUTMENT TEETH.

Besides serving as a breeding-place for bacteria, the usual kind of bridge work which, in the exercise of our vocation, we are sometimes called upon to clean, and which we must condemn, serves also to rob the abutment teeth and the surrounding gum tissue of every chance of free and unhampered motion, and such work brings about all the deleterious consequences mentioned above. It will be well for us to remember that in all cases where teeth have been lost, and where artificial substitutes in the shape of bridge work have been resorted to, the rational procedure to follow is to make the mucous structure carry the stress. The abutment or natural teeth which act as supports for the bridge must simply serve to prevent the vertical displacement of the bridge during mastication, and they must so interplay with the bridge that they themselves will be effectually kept from migrating into fields other than their own. Outside of these two functions, nothing more should be expected from abutment teeth.

REQUIREMENTS OF CORRECT BRIDGE WORK.

The bridge itself must, during mastication, gently ride on the mucosa-covered alveolar ridge, and thus be made to supply the intermittent stimulating interference essential for the enhancement of nutriment by virtue of the increased circulation to the end tissues.

Artificial restorations in the form of bridge work must be constructed so that they will not interfere with the maintenance of the hygienic balance essential to proper sanitation. Whenever the circumference of a crown extends away from the gingival circumference of the tooth, it exerts an inhibitory interference with the maintenance of correct oral conditions. Any piece of bridge work offering lodgment to food débris, or exercising an unequal pressure upon the alveolar ridge, or lacking in occlusal restoration or anatomical design, causes inhibitory interference with the maintenance of correct oral conditions. The elimination of such inhibitory interference by a proper restoration is therefore essential to the health of the individual.

Abutments in fixed and removable bridge work. What has been said of bridge work as a whole applies, of course, to abutments and attachments in detail. Abutments may be broadly divided into posterior and anterior ones. One of the first essentials in the construction of these piers is rational and radical root-work when the pulp is involved. Time will not permit the discussion of this phase of the work, but we will remember that if any root-canals are referred to, it is to be assumed that they have been properly taken care of.

The sum total of anchorage, that is, the sum total of surface contact between the post and root surface of the crown and the root, must be at least one-third greater than that part of the abutment which is exposed to grinding or triturating stress. This calls for a preparation of the root which varies with the direction of stress which these teeth are called upon to resist. The

root-end must present certain angles, and these angles vary in obliquity inversely as the stress—*i.e.* the greater the stress, the less oblique the angle.

What has been said of the non-interference of the bridges as a whole applies most forcefully to the abutments. The continuity between the abutment crown and the root or tooth upon which it rests must be left unbroken. Great care must be exercised not to encroach too deeply upon the subgingival area, and the impairment of the peridental membrane must be carefully avoided.

No post which is so large in size as to threaten the integrity of the root should ever be used. If, for any reason, it becomes necessary to use a post longer than two-thirds of the root, the post should taper for the gingival half of its length and be cylindrical for its occlusal half, and its occlusal half should be threaded.

Anterior abutments in removable bridge work consist either of a root-cap and tube, a root-floor and tube, a lingual inlay and tube, or an artificial crown carrying some slot or sleeve or post.

Posterior abutments in removable work may consist of either a telescope crown or a shell crown, and they may contain a keyed slot, or may carry a tube or post either in a vertical or a horizontal direction, or the root of the posterior tooth may be prepared to receive an inlay which, in turn, may carry a post either in a depression presenting itself upon the inlay occlusally, or a post attached to it in an upright position.

We must always remember that we expect these abutments to serve in preventing vertical displacement of the bridge by their relation to the attachments which will engage them, that is, they must prevent any vertical displacement beyond the linear height presented by the displacement of the soft tissue during mastication. It will also prove decidedly advantageous to construct our abutments so that they will engage our attachments in a manner which will admit of some latero-rotary play during the exercise of the usual functions, and finally, any completed abutment must be so made that it will restore to the mouth a dental organ capable of exercising all the functions for which nature intended it, viz, mastication, trituration, incision, prehension, and vocalization.

In fixed bridge work, the abutments may consist of inlays supported by posts as root anchors, of Darby crowns the bases for which have been cast, of shell crowns made in accordance with a technique outlined by the essayist some years ago in *Items of Interest* in an article entitled "The Metallic Molar Crown." The same general rules which apply to the abutments for removable bridge work hold good here, and the necessity for contact surface between the abutments and the tooth or root carrying it is greater in fixed than in removable work.

The reason for this is simple enough, when we remember that the principle involved in removable work is always that of the pontoon bridge, while that involved in fixed work is always that of the arch, span, and suspension. A pontoon bridge is one which is supported through its entire length upon yielding cushions, while a fixed bridge is one in which two or more piers carry a span of certain length.

Exception may be taken to this latter definition, and it may be urged that some construct their fixed work so that there is a definite point of support for each artificial tooth making up the span, which support they obtain by scraping the model, so that the artificial tooth is fairly buried in the mucosa. The answer to this would be, first, that such action is against all principles underlying the maintenance of nutrition in the end tissues, and that no matter how harmless the result may seem to be, it is at best but tolerated by the tissues, and constitutes a condition not conducive to the health of the individual. It tends permanently to displace tissue from its proper environment, and to usurp the location for itself in a spirit of unfriendly conquest which nature always resents, and ultimately punishes us for.

The occlusion in abutments for fixed or removable work requires the very minutest attention, and the very ideal

in occlusal restoration must be worked for, if we seek permanence of the work. Reference is here made to the final requirements of abutments, that is, all abutments must be so made that they will restore to the mouth a dental organ capable of exercising all functions for which nature intended it, viz, mastication, trituration, incision, prehension, and vocalization.

ATTACHMENTS.

Attachments are the intermediary agencies which link the artificial restoration known as bridge work to the abutments. They are made a movable or fixed part of the bridge, as the case may require. This requirement will be made clear from a consideration of the study models and a study of the direction of stress to which the abutments and the bridge will be subjected. Wherever possible it is best to have the attachment form the male portion of an appliance, which will be completed when this portion is inserted into a corresponding female part existing in the abutment.

The one essential fact to remember in the construction of attachments is that they must definitely and frictionally engage whatever space exists for them in the abutments, any lateral-rotary play being provided by a semi-tubular spring or claw or construction, or by the provision of an arc of sufficient curve to take into account the amount of soft tissue displacement during mastication.

If a box and a friction plate be used, the box must be placed into the abutment and must run as nearly buccolingually as possible. Its shape must be rectangular. The friction plate attachment is joined to the bridge, and it is so filed gingivally that it presents an arc to which the perfectly straight floor upon the gingival part of the box shall be tangent. The sides of the friction plate are filed in the same manner. We thus produce a straight line tangent to a curve.

PARALLELISM.

The parallelism of the two attachments and abutments will enable the bridge to yield in a vertical direction under stress, while the three curves upon as many sides of the friction plate will provide a lateral yield. The sum of the yield provided plus the resilience of the gum tissue will result in the latero-rotary yield essential to all imitation of natural tooth movement.

We have mentioned the parallelism of the abutments and attachments, and we all realize that this is the essential mechanical requirement of a bridge. If the bridge is to be a fixed appliance, the abutments must be parallel, because we must be enabled to cement the bridge into position without exercising any pathological stress upon the pier teeth. If the bridge is removable, the abutments must be parallel, so that the parallel attachments may engage them frictionally and easily, and the appliance may ride gently upon the mucosa during mastication. In order to obtain such parallelism, certain instruments, called *parallelometer* and *parallelodrill* respectively, have been designed. (See next page.)

Explanation of Figures.

Fig. 1 is an illustration of the *parallelometer*, carrying all the measuring posts A, B, C, D; E is the adjustment screw.

When the distance between two anterior teeth which are to be used as abutments for a bridge is more than twenty-five and less than forty millimeters, the posts A and B are used as determinators for distance and parallelism, A being the unit point and B the movable point. When the distance between the two teeth is more than ten and less than twenty-five millimeters, A is the unit point and C the movable point. When the distance between the two teeth to be used as abutments for a bridge is more than seven and less than ten millimeters, A is the unit point and D the movable point for determining distance and parallelism.

In this way a system of measurements is obtained which requires a constantly increasing number of turns of the screw E as the distance between the various posts decreases. It virtually means the application of the 47th problem of Euclid, because we are here measuring the hypotenuse of a right-angle triangle in terms of the base.

Fig. 2 shows the parallelometer carrying measuring posts A and B and determining the

Fig. 1.

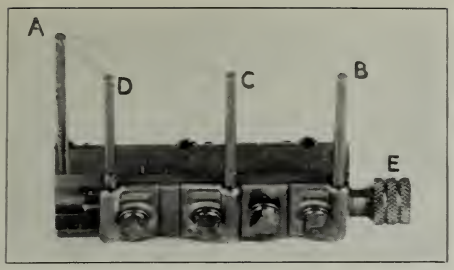

Fig. 2.

Fig. 3.

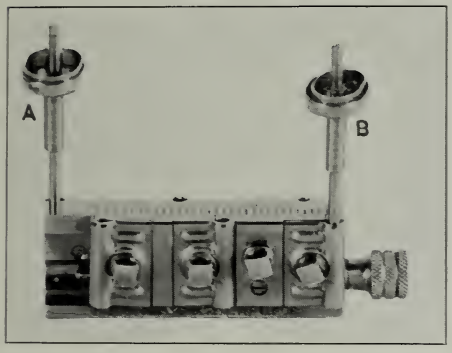

Fig. 4.

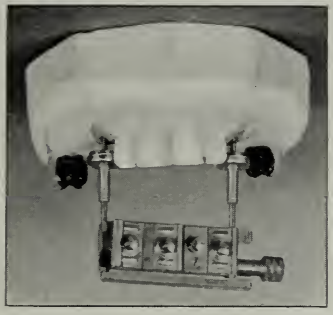

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

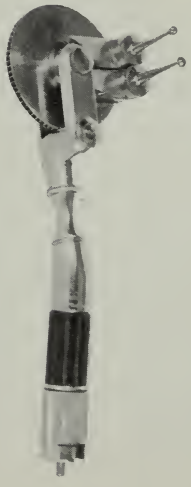

Fig. 9.

distance and parallelism of two canine teeth in the skull.

Fig. 3 shows the parallelometer and two measuring posts forty millimeters apart, and shows these two measuring posts carrying two friction trays, A and B respectively, which

Fig. 10.

trays are used for taking impressions of root-caps placed upon the roots of two canine teeth or two bicuspid teeth, and taking these impressions in parallelism.

Fig. 4 shows the parallelometer carrying two measuring posts and two friction trays, and shows these measuring posts entering the roots of the two canine teeth, and the friction trays about to take an impression of these two canine teeth in parallelism.

Fig. 5 shows the application of the parallelometer on a model when it is used to parallel posterior bridge attachments to anterior ones.

Fig. 6 is an illustration of the *parallelodrill*, a dental engine accessory which will drill two holes at the same time in two different teeth, and drill them parallel to each other.

In this illustration the drill-heads carrying the drills are seven millimeters apart. The distance between any two teeth which are to serve as abutments is first determined by the parallelometer, then this distance is laid off on the parallelodrill, the drill-heads are locked in that particular relation, the drills are then inserted, and the two holes or caissons are sunk into the teeth or roots the required distance apart and parallel to each other.

Fig. 7 is an illustration of the drill with the two drill-heads thirty-five millimeters apart.

Fig. 8 shows the parallelodrill with the two drill-heads seven millimeters apart and arranged at right angles to the driving-shaft. In this position the drill may be used either on the right lower or left upper jaw. It may be placed on the opposite side of the large driving-gear, and so may become available to be used on the left lower and right upper jaw respectively.

Fig. 9 is an illustration of the parallelodrill with the drill-heads thirty-five millimeters apart and placed diagonally across the large driving-gear.

Fig. 10 is an illustration of the parallelodrill, the two drill-heads carrying two drills which have entered into the two canine roots.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

A BIOLOGIC TEST FOR ARSENIC.

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THE quantity of arsenic trioxid which is employed for the purpose of destroying the tooth pulp is of necessity minute. As the writer has stated elsewhere*—"A careful estimation has shown that the average mature pulp requires about 1/30 grain (0.002 gm.) for its complete devitalization." This estimate was based on diverse weighings of quantities of arsenical paste as empirically employed by several practitioners in their routine work. Other writers, *i.e.* Arkövy, Gorgas, Clifford, Lipschitz, Bannog, etc., have estimated the amount as varying from one-hundredth to a twenty-fifth of a grain. That the amount of arsenic for the pur-

* Prinz: "Dental Materia Medica and Therapeutics," 1912, page 212.

pose in view is extremely small is well illustrated by the following experiment: Metnitz successively killed with the same little pellet charged with arsenical paste, sixteen pulps, and the pellet still retained enough arsenic to cause necrosis in a leg of a frog.

The first and apparently only successful investigation concerning this important question was carried out by the late Prof. J. Foster Flagg. The results were published in a series of papers in the Dental Cosmos for 1868, entitled "Arsenious Acid as a Devitalizer of the Dental Pulp." The results obtained by Flagg are of such paramount importance to the question under discussion that the writer feels justified in quoting him *verbatim:*

> It is now several years since I began to doubt the truth of the "inflammatory and tooth destroying" results of arsenious treatment attributable to "duration of application," from the fact that on various occasions patients had, from sundry reasons, neglected presenting themselves at the time appointed for the removal of pulps, and had allowed a number of days to elapse which were, according to the books, sufficient to induce great trouble; . . . I therefore instituted a gradual increase of duration of applications, watching carefully the cases, until year after year told me that I could with perfect safety permit them to remain until the pulps were dead and had sloughed—thus rendering their entire removal a thing easy of accomplishment, and doing away with all the terrors to the minds of those who were about to submit to the operation. After having demonstrated this, I commenced saving such pulps as had been extirpated entire and without pain, as the result of from seven to fourteen days' application each. I tested ten of these together for arsenious acid by Reinsch's test, which possesses the requisite in this case of giving the amount of this substance present; a proof of its presence was obtained, which was duplicated in a solution containing 1/100,000 of a grain of arsenious acid, thus giving as the amount contained in the tissue of each pulp the 1/1,000,000 of a grain! Ten pulps, extirpated painlessly and entire, were next taken and tested, with about the same results; while from the ten cottons upon which the applications were made, quite one-third of a grain was obtained—thus showing that no apparently adequate amount of arsenious acid has been taken up by the pulp tissue, and that death of the organ having ensued, the dead tissue had acted for so considerable a length of time as a preventive to further exhibition of the poison.

Other investigators, *i.e.* Preiswerk, Römer, Detzner, Prinz, etc., have tried to show the presence of arsenic in pulps killed by it, employing respectively the Marsh, Reinsch, Gutzeit, and other tests. The results have always been negative. Detzner, who employed the Marsh test, was not able to show even the minutest traces of arsenic in the pulps killed by it, but he claims that he was able to obtain a distinct arsenical mirror from solutions of the hard tissues of the tooth. According to his conception the arsenic passes into the dentinal tubules and remains there as a deposit. In a case of arsenical necrosis the presence of arsenic could be demonstrated in the necrosed tissues by the modified Gutzeit test. Very recently the writer took up the question anew. He employed the biologic test, which proved to be extraordinarily delicate, and he succeeded in verifying the findings of J. Foster Flagg.

ESTIMATION OF THE WEIGHT OF THE HUMAN TOOTH PULP.

In experimental pharmacology the toxic dose of a substance is expressed by estimating the quantity necessary to kill one kilogram of body weight. Naturally, the dose differs with the species of animal employed. In establishing the dose of arsenic necessary to kill a human tooth pulp, an estimation of the weight of the latter is necessarily required. The writer has not been able to find any reference to this phase of the subject in the literature.

The human tooth pulp is an organ undergoing continuous retrogressive changes, *i.e.* from a fleshy mass in the developing tooth, it reduces its own bulk with advancing age, frequently becoming completely atrophied. The size of the pulps of the various types of teeth naturally differs markedly; consequently, an estimation of the exact weight of a single pulp is impossible. Nevertheless,

an average suitable for our purpose may be obtained by dividing the weight of twelve sound fresh pulps of six upper and six lower teeth, between the ages of twenty to fifty, and ranging from centrals to first molars, by their own number. (As the pulps dry out rapidly, they must be kept in a moist chamber.) It was found that the average weight of a single pulp of this lot amounted to a ¼ grain (15 milligrams).

TOXIC DOSE OF ARSENIC.

The average fatal dose of arsenic is most uncertain, its toxicologic effect being altered by many conditions. From an estimate based on a number of fatal reports and on experimental work, it was found that, on an average, 3 grains (0.2 gm.) in due time will kill a man of 150 pounds (about 70 kilograms). Consequently, one part of arsenic destroys the vitality of 350,000 parts of human tissue. If we transfer these figures to the average weight of a pulp, theoretically, one grain of arsenic will destroy 1,400,000 pulps, or, reversing these figures, the average pulp will be destroyed by 1/1,400,000 of a grain. These figures, although obtained by a different mode of experimentation, average fairly well with those obtained nearly fifty years ago by Flagg.

BIOLOGIC TEST OF ARSENIC BY PENICILLIUM BREVICAULE.

For some time past it has been known that certain molds grown upon media containing traces of arsenical compounds produce volatile arsins, which are characterized by a pronounced garlic-like odor. Gosio* succeeded in isolating seven varieties of molds, of which *Penicillium brevicaule* (small, pencil-like, short-haired) possesses this property to the highest degree. According to Abel and Buttenberg† 1/64,000 of a grain (0.000001 gm.) of arsenic trioxid represents the smallest quantity to be estimated by this method. The volatile compounds liberated by the growth of the mold represent a mixture of arseneted hydrogen and arsenic diethylate. The volatile compounds may be decomposed by passing them through a Marsh tube, and thereby the typical arsenical spot or mirror is obtained. The great advantage of this biologic test over the many chemic tests consists in utilizing

FIG. 1.

Luxuriant growth of *Penicillium brevicaule* on sterile bread dough charged with pulp tissue destroyed by arsenic.

the poisoned tissues directly without first going through the tedious process of destroying their organic contents, and in that only a minute quantity of the suspected material is required.

Methods of procedure. A ready available medium for the rapid growth of the mold is furnished by the crumbs of white or Graham bread; the crust must not be used, as it has a more or less specific aromatic odor. The bread is mixed with sufficient distilled water to form a rather stiff, pasty mass. It is transferred to an Erlenmeyer flask of

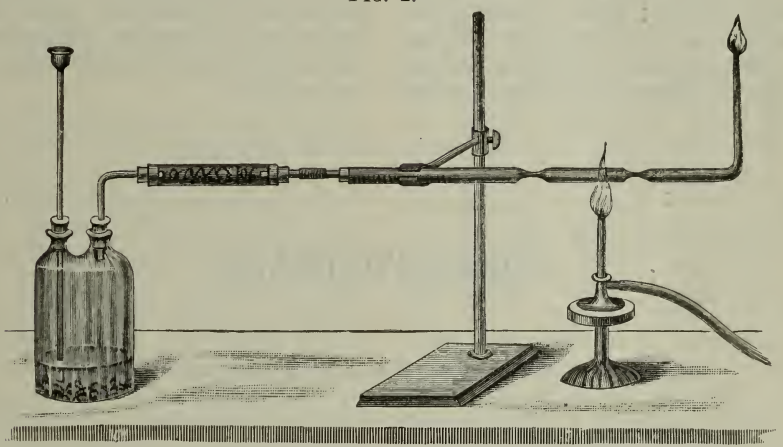
* Gosio: "Revista d'igiene è sanita publica," 1892, p. 201.

† Abel u. Buttenberg: *Zeitschrift für Hygiene*, 1899, p. 440.

about 100 cc. capacity, covering its bottom to the depth of about ¼ inch. Dry bread crumbs are now sprinkled over the surface to absorb the surplus water. The suspected material containing arsenic* in powder form, or cut into as small pieces as possible, or broken up with a small quantity of river sand, is now evenly distributed over the moist bread surface. The flask is closed with a cotton plug and sterilized in a steam autoclave for from one-half to one hour. When sufficiently cooled, the sterilized material is inoculated with a fresh pure culture of the mold by dropping pieces of the potato upon which the mold has grown into the flask. The flask is closed with a tightly fitting cotton plug and sealed with paraffin or a rubber cap drawn over the plug. The mold grows best at body temperature; if an incubator is not available, warm room temperature will answer the purpose, although the growth is somewhat slow. Usually, within three or four days, a luxuriant growth is noticed (see Fig. 1), and incidentally with its development the looked-for garlic odor becomes more and more pronounced. This alliaceous odor can be detected in the closed flask for many weeks after the experiment is made.

An arsenical mirror of the accumulated arseneted hydrogen compounds is readily obtained in the following manner (see Fig. 2): The Erlenmeyer flask is fitted with a rubber stopper having two perforations. In the one opening, a long-stemmed separatory funnel is pushed so as to nearly touch the growing mold, and in the other opening, a Marsh tube, *i.e.* a glass tube of about 1/8 inch in diameter and bent at right angles is inserted. The long arm at its center part is drawn out to a narrow tube for the space of an inch and the short arm must pass just through and beyond the rubber stopper. The long arm is covered with a piece of rubber tubing closed by a pinchcock. The closed separatory funnel is filled with mercury and the Marsh tube at the beginning of its point of constriction is slightly heated over a low gas flame. The stopcock of the funnel is slowly opened and the advancing mercury displaces the arsenic compounds which pass over the heated part of the glass tubing. Within a few minutes a distinct black deposit, *i.e.* metallic arsenic, is observed near the constricted part of the tube. The experiment must be conducted in a room free from draft, and the operator is cautioned not to

FIG. 2.



* The material consisted of about ten pulps which had been killed in the routine way with arsenical fiber by students in the college infirmary.

inhale the highly poisonous arseneted hydrogen.

From a pharmacologic point of view it should be remembered that arsenic is a protoplasm poison, *i.e.* affects living tissues only. If we apply this law to the living pulp to which arsenic has been applied it means that the pulp absorbs the amount necessary for its destruction; after this absorption has ensued no further absorption of the poison occurs. This fact is readily demonstrated in the laboratory. In bygone days it was customary with many practitioners to leave a small quantity of arsenical paste upon the dead pulp remaining in the canal for its future preservation prior to placing the permanent filling. While it did not accomplish the desired purpose, no ill effects have been recorded from arsenical absorption. Since the various chemic tests have all failed, except in the hands of Professor Flagg, to reveal the presence of arsenic, and, on the other hand, as the biologic test distinctly indicates its presence, it may be seen that the quantity of arsenic actually absorbed by the pulp for the purpose of killing it is most minute. Consequently, in clinical practice, a much smaller quantity should be employed than the one empirically mentioned in text-books. The objection may be raised that under certain conditions arsenic will act on the diseased pulp only very dilatorily or not at all. This objection involves certain phases of therapeutics which have no bearing on the subject under consideration, and are left for discussion at some future time.

CORRESPONDENCE.

OTHER VIEWS ON DESENSITIZING PASTE.

To the Editor of the Dental Cosmos:

Sir,—I have just read the interesting but rather discouraging report printed at page 544 of the May Dental Cosmos, by Dr. Alfred R. Starr of New York city. The brief report closes with a statement that the writer fears I have made a mistake in claiming so much for the desensitizing paste. If the Doctor's experience with this preparation was that of the hundreds of others who are using the preparation today, I certainly would be forced to admit that I had made a mistake in recommending this preparation as I did in the article which appeared in the December *Items of Interest*. But, so far as I am able to learn, such results are not obtained by the men who are using the remedy as recommended. Judging from Dr. Starr's report, one would be led to believe that he had used the remedy generously in practically all cases in his practice. I am sure that the average practitioner does not use analgesia or conductive anesthesia in the larger percentage of cases; neither did I intend to have desensitizing paste used in every case. The use of all such means, in my opinion, should be confined to those cases of hypersensitive dentin in which the pulp of the tooth is uninvolved, and in which permanent work cannot be accomplished without inflicting more pain than we are justified in doing today, with the different methods at our command.

It has also come to my knowledge that a statement was made at the recent meeting of the Michigan State Dental Association to the effect that desensitizing paste will cause death of the pulp in practically every case in which it has

been used. In this connection I desire to say that before this preparation was offered to the dental profession it was given every test, including the reliable test of *time,* to ascertain whether or not it was a safe and reliable remedy to be used for purposes for which it was intended. A great deal of experimenting was done by myself in the laboratory, and after the formula was worked out it was given every clinical test both by myself and others. It was found that the remedy will not affect sound dentin to any appreciable depth; and if used in cases where there is sound and healthy dentin intervening between the cavity of decay and the pulp proper, *it is absolutely impossible to devitalize the pulp or affect it deleteriously with the remedy.*

It is an easy matter for those who are still suspicious of the permanent effects of desensitizing paste upon the pulp to determine for themselves whether or not sensation returns in dentin which has once been desensitized by the remedy. If the preparation is applied to and sealed in contact with exposed sensitive areas at the necks of teeth for a period of twenty-four hours or longer, it will be found that the sensitiveness is completely destroyed. It will also be found that in about three weeks' time the sensation will begin to recur, and in five or six weeks the areas in most cases will be as sensitive as they were before the preparation had been used. In fact, the effect of desensitizing paste on sound dentin is so transitory that I have practically abandoned its use for sensitive necks of teeth, preferring to use other means which will produce more permanent results. While the remedy will go through decayed dentin like wildfire and completely destroy all sensitiveness therein, it has been the experience not only of myself, but others, that the remedy will not affect sound dentin to any dangerous depth.

It was never intended that desensitizing paste should be employed in cases of extensive decay, unless used with the idea of subsequently removing the pulp should it be found that the decay had extended to or nearly to the organ. The remedy is recommended for *hypersensitive dentin* where the pulp of the tooth is uninvolved. In such cases it is a specific and its use is absolutely safe.

It seems to me that the test of time is the best one, after all, to give any remedy. It is now about fourteen months since I first requested certain men of the profession to use desensitizing paste in their practice. A word from some of these men will be of interest. I am privileged to herewith submit a voluntary statement from three men whose reliability and sincerity of purpose cannot be questioned.

Dr. Hart J. Goslee says: "I have just read in the May Dental Cosmos Dr. Starr's history of his experience with desensitizing paste, and have also heard of similar statements being made recently at the Michigan State Dental Association. These experiences are so diametrically opposite to my own that I feel I must immediately communicate mine to you. In the last twelve months I have used desensitizing paste in more than two hundred cases without the death of a single pulp, to my knowledge. I have exercised care as to where I have used it, never using it unless it was necessary, and never in cases where there was any great doubt as to the advisability of conserving the vitality of the pulp; and while I have had to make two, and occasionally three, applications in some instances, and have frequently had patients complain of a more or less severe toothache immediately following its application, not a single case has so far reported in which the death of the pulp has followed. That others should have results so different from these is quite a surprise to me, and prompts me to thus communicate my experience to you."

Dr. J. V. Conzett says: "In regard to desensitizing paste, let me say that I have had none of the trouble you speak of in your letter. I had one pulp that ached after the application, and I devitalized it; but that is the only one, and the patient was one that I always have trouble with. The probabilities

are that in that particular case I would have had the same trouble if I had not used the paste. As you know, I am using the stronger paste than the one you have on the market; and you will remember that I advised you to put out the stronger one, but you thought best not to do so. You may say that I unqualifiedly indorse the paste, and use it constantly."

Dr. Chas. E. Bentley writes as follows: "I have recently heard some mutterings concerning the effect of your desensitizing paste upon the pulps of teeth. Having been favored by you in being among the first to use it, my experience may be of some interest. I have to date used it in 130 cases; in one case, a bucco-occlusal cavity in a lower second molar, the pulp died after administration. I was particularly careful in opening into the said pulp for the reason that I suspected a minute exposure might have existed before the application of the paste. To my surprise, I had to cut through about one-eighth of an inch of secondary dentin before I reached the pulp, which convinced me that more or less irritation existed before the application of the paste. I am therefore unable to state whether the paste, previous irritation, or both, were the cause of pulpal death. From the experience I have had I am willing to take the chance of 130 to 1 for the benefits I get from the use of desensitizing paste."

I think that it is only fair to the readers of your journal and to myself, who introduced desensitizing paste to the profession, to publish these statements in the next issue of the DENTAL COSMOS, for the benefit of those who are interested. I am interested only in the truth regarding this preparation, and I know that if it be used as first recommended, it will prove a valuable remedy in the hands of careful men.

Very truly yours,

J. P. BUCKLEY.

CHICAGO, ILL., May 10, 1915.

PROCEEDINGS OF SOCIETIES.

UNION MEETING OF THE FIFTH, SIXTH, SEVENTH, AND EIGHTH DISTRICT DENTAL SOCIETIES OF THE STATE OF NEW YORK.

Held at Buffalo, N. Y., November 19, 20, and 21, 1914.

THE union meeting of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York was held in the Iroquois Hotel, Buffalo, N. Y., on November 19, 20, and 21, 1914.

The meeting was called to order on Thursday morning, November 19th, at 11 A.M., by Dr. J. G. Roberts, Buffalo, president of the Eighth District society.

Rev. Dr. Ernest L. Waldorf, Buffalo, invoked divine blessings on the deliberations of the meeting, after which addresses were made by Dr. A. M. Wright, Troy, president of the New York State Dental Society; Dr. J. N. Garlinghouse, Clinton, N. Y., president of the Fifth District Society; Dr. H. H. Turner, Marathon, N. Y., president of the Sixth District Society; Dr. George C. Lowe, Rochester, president of the Seventh District Society, and Dr. J. G. Roberts, Buffalo, president of the Eighth District Society.

The meeting then adjourned until the afternoon session.

THURSDAY—*Afternoon Session.*

The meeting was called to order at 2 P.M., by Dr. J. G. Roberts, president of the Eighth District Society.

The first item on the program for the afternoon session was the reading of a paper by Dr. H. T. STEWART, New York, entitled "Reasonable Methods in the Treatment of Riggs' Disease." Dr. Stewart's paper was discussed by Dr. M. C. Bradley, Rochester; Dr. T. A. Hicks, Buffalo; Dr. J. M. Tench, Buffalo; Dr. J. O. McCall, Buffalo; Dr. R. E. Luther, Batavia; and Dr. Stewart, closing the discussion.

The next item on the program was the reading of a paper by Dr. F. W. PROSEUS, Rochester, entitled "Standardizing of Operations and Methods in Dental Dispensary Practice."

[This paper is printed in full at page 775 of the present issue of the COSMOS.]

Discussion.

Dr. J. O. MCCALL, Buffalo. The matter of systematizing methods of dispensary work has come to be a very important one. In the early days of this work, we were more impressed with the importance of getting the profession interested in it than anything else, but we did not think much of the exact method to be followed. At present, however, dispensary work has come to be a routine part of our professional work, and it is important that we give due consideration to the details of that work. Only those who have actually conducted examinations in schools and institutions know the conditions which prevail in children of various ages and realize the necessity for systematic dental hygiene and the benefits derived therefrom. While it is very important that permanent first molars weakened by

caries or with exposed or putrescent pulps be given careful attention, yet it is more important that the operator's valuable time should be spent on young children whose permanent first molars have not yet erupted or have just appeared, because at such an early age small fillings will go so much farther toward preventing the necessity of more extensive work later on. In this respect, I agree with the essayist in his proposed method of coping with the situation. At the Buffalo Orphan Asylum we are adopting the policy of taking care of the children who enter, and doing only relief work for the older ones, who will probably leave the institution in a few years. Those who enter are carefully examined, and their mouths are put in proper condition at a time when the minimum amount of work will accomplish the greatest result. They can subsequently be kept in good condition with a comparatively small amount of work.

The methods proposed by the essayist, I think, we can commend as a whole, although the use of amalgam in anterior teeth may stagger us for an instant. A careful consideration of the possibilities of amalgam restorations, however, makes that procedure appear justified as a part of dental dispensary work without any qualms of conscience. The main objection to amalgam, of course, is the question of discoloration, but the discoloration of a tooth can usually be avoided by a proper cement lining. I formerly used to insert a great many amalgam fillings over a cement lining which was still in a plastic condition, burnishing-in the amalgam, squeezing out the excess of cement, and burnishing the amalgam down to the margins. In that way I found it possible to avoid discoloration of the tooth, and in my opinion such a filling is quite as permanent as an amalgam filling inserted by the ordinary methods. In later years, when the patient is old enough to earn his own living, these fillings may be replaced with permanent and better-looking materials. Silicate cements, of course, may prove sufficiently durable.

The preservation of the permanent first molar is one of the most important features in our oral hygiene work. We should call the attention of the public to its importance, and preserve it in the mouths of patients who present in the dispensary. The first permanent molar is the most important tooth in the mouth, and only those who are especially interested in the cause of pyorrhea can realize the amount of harm done in the mouth by the loss of the permanent first molar before the rest of the teeth have been established in proper occlusion. Malocclusion in many mouths can be traced back to the irreparable loss of one or more molars. Even though, as the essayist suggested, we sometimes cannot preserve this tooth ideally, yet we should at least keep it in the mouth, if this can be done without abscess formation, until the other molars are in position, so that consequent disfigurement of the arch is avoided.

The work of our dental dispensaries, in my opinion, has progressed to a point where we can give more attention to the question of filling materials, etc., in addition to educational work.

Dr. Emanuel Muntz. Buffalo. I observe that the essayist in his dental dispensary work has met with a condition which has confronted us here since the inception of this work—viz, "an endless mass of difficult cavities, exposed pulps, and abscesses always ahead of the dentist"—and I am especially interested in his method of solving the problem, namely, unless all can be cared for, to ignore the bad or advanced cases, and apply our energies toward the prevention of extreme conditions by caring for teeth before the ravages of caries advance so far. Let prophylaxis in its broadest application be the keynote of this work!

I fully concur with the essayist in his suggestion to devote more than one sitting to scaling and polishing of the teeth. This method I have employed in my private practice for a number of years, with excellent results. I wish to add, however, in this connection, that the best dispensation of charity consists

in helping the recipient to help himself, and I endeavor to impress my little charges with the importance of cleaning their teeth themselves. Most of them claim to have a personal tooth-brush; some of them lack a dentifrice. When children are too poor to purchase either, I recommend the use of white soap applied with a piece of Turkish toweling wrapped around the finger. In large quantities a good dentifrice could be prepared cheaply and distributed to these patients in paper boxes. A judicious distribution of this material would save embarrassment to the patient and valuable time to the operator, but I scout the advisability of distributing free tooth-brushes, which is sometimes recommended.

To extract or not to extract, that is the question. The indications or contra-indications to extract often require rare judgment, and the safest rule seems to be the appointment of an operator who has such judgment.

I would take exception to the essayist's views regarding tooth-filling materials. I believe in using the so-called permanent materials wherever conditions warrant their use, but I cannot agree with the extensive use of amalgam, even when the cavity is lined with cement, in anterior teeth. I also believe that we could dispense entirely with the silicate fillings to advantage, and substitute the different shades of zinc phosphate, as we should use the phosphate cements also in posterior teeth to a considerable extent. I hold no brief for the zinc phosphate cements, in fact dislike them, but in dispensary practice I have been able by their use to save many badly decayed teeth in which enamel only formed the walls of the cavity.

I am particularly pleased that the essayist considers the treatment of a number of teeth or cavities in one patient at one sitting preferable to treating a large number of patients at one session. I have contended for that ever since the opening of our dispensaries, without receiving much encouragement in my view. I would, however, vary the essayist's method of dealing with several cavities, and substitute the following: When a patient exhibits several cavities presenting diverse stages of caries, I should open the worse ones first to ascertain the probable length of time or the number of visits needed for treatment, and determine how many of the simpler cavities could be filled at each sitting given for the treatment of the more complicated cavities, and govern myself accordingly.

While in the main, the same or similar conditions obtain in most, if not all urban communities, the details of procedure must be modified according to the numbers to be served and the facilities available for rendering the necessary service. My remarks have been made largely with a view to suggesting to our local advisory board what my comparatively short but strenuous experience in dental dispensary work has taught me to be applicable to the conditions which obtain here in Buffalo.

Dr. G. B. Mitchell, Buffalo. Dr. Proseus has opened my eyes as to the possibilities of amalgam and cement fillings, of which I had an entirely wrong idea. In the last four or five months I have seen perhaps five thousand school children, and I have come to the conclusion that the salvation of the permanent first molar is next in importance to the cleansing of the teeth, because I find that before decaying, the anterior teeth show stain and large tartar accumulations, and in the majority of cases the second molar decays rather than the anterior teeth. One peculiar observation in this connection is that, while the permanent first molar in the lower jaw is decayed in ninety-eight per cent. of cases, we find the upper first molars free from caries. I have also noticed hundreds of cases of Hutchinson's teeth, but whether this symptom is confined to the teeth or not, I do not know. In the Italian colony especially, there is quite an abundance of that type of teeth.

Dr. G. C. Lowe, Rochester. I would like to support very heartily the essayist's remarks in regard to the use of amalgam. I feel that the permanence of the work which we can do is of greater

importance than its esthetic appearance. The greater part of dispensary work is charity work, and these patients think more of permanence than of esthetic value. If, in later years, they think enough of their teeth to care for esthetic effect, these fillings can be replaced by a different material, but in the meantime the teeth have been preserved. I have seen a number of Dr. Proseus' fillings which for several years have kept the teeth in a beautiful state of preservation. If these teeth had been filled with phosphate cement, the fillings would all have disappeared in that time.

The essayist's suggestion in regard to taking care of the younger patients works out admirably in an institution, but it is hardly practicable in a public dispensary, for we must take care of patients regardless of their age and the condition of their teeth; we cannot take care of the younger patients and discard the older. Nevertheless, if any work has to be neglected owing to lack of time, I would advise letting the worst cases go, and taking care of the smaller cavities.

Dr. W. A. White, Phelps, N. Y. It was said by one of the discussers that dental dispensaries first saw the light in Rochester. Perhaps many believe that this remark refers to the dispensary as it is now being conducted, but I can recall the time when the first dental dispensary was established in Rochester, thirty years ago, by Dr. H. S. Miller, and one gentleman present, Dr. Smith, served at that time. When the dispensary was first established, we did our work at the general hospital, but that proved a failure, because it did not receive proper support. I believe that was the first dental dispensary in the world, and it was followed by the establishment of others throughout the country; so that Rochester is known today as the mother of the dental dispensary. The amount of work that is being done there is phenomenal and very gratifying to those who are interested in it. But equally efficient work is being carried on in many other cities and towns throughout the country. I learned today that across the border, in Toronto, there are thirteen free dental school dispensaries, and three more are to be installed. In Chicago there are ten dispensaries, and I understand that oral hygiene is going on very satisfactorily in Buffalo.

In my work I have dwelt particularly on the preservation of the permanent first molar. I have tried particularly to emphasize the necessity of preserving this tooth not only for the maintenance of the normal arch and the occlusion of the teeth, but for the proper development of the face and the facial muscles, and for the preservation of the general health of the child. Some time ago, when a lecturer for the department of health laid particular stress on the importance of the preservation of the permanent first molar, one of the most prominent dentists in New York took issue with him, and wrote to the state department of Health expressing his hope that they instruct that lecturer to desist from teaching children to make every effort to preserve this tooth, because this statement was not true, and that the only way to produce proper occlusion of the teeth was the extraction of the permanent first molar as soon as it made its appearance through the gum. The department asked for an opinion, and I wrote one that was very emphatic. I called a spade a spade, and have heard nothing more from it.

I want to congratulate Dr. Proseus on his valuable and instructive paper. I believe that, if his ideal is carried out in regard to permanent work up to a certain period, we shall be able to do a great deal more good in the future than we have in the past.

Dr. B. W. Palmer, Rochester. We have not adopted in Rochester the amalgam filling as Dr. Proseus advocates it. Our plan has been to try to preserve the teeth until the children are able to work. Most of them begin work at about the age of fourteen, and by that time we think they can look after their teeth themselves. The essayist's idea is new in regard to dispensary methods, and may be a good one.

Dr. M. B. Eshleman, Buffalo. I am

gratified to find how much of value can be brought out in a few minutes, and although it looks as if only a few were interested in this work, judging from the small attendance, there are many more present than there would have been fifteen years ago to listen to this subject.

I was in Toronto with several gentlemen, a short time ago, to see some of the work that is being done there. Three years ago the inspections in three schools in Toronto showed from 92 to 98 per cent. of the children to have defective teeth. In these same schools the percentage is now from 52 to 55. The three schools cited are located in the poorest districts of Toronto. Among the children in some of the districts where the people are "taking care" of their own teeth, we find sixty-five per cent. with defective teeth, which shows that in schools with dental dispensaries, the results of a short three years' work are better. There are now twelve dispensaries in Toronto, and three more will be ready for operation by December 1st. The work there is under the supervision of the educational department, while here in Buffalo we are working under the direction of the board of health. We are making progress, however, and hope in a few years to report conditions similar to those existing at present in Toronto. I would like to know Dr. Muntz' reason for objecting to the distribution of pastes and brushes?

Dr. Muntz. I do not object to the distribution of pastes; I think, however, that a good tooth-powder can be made more cheaply than a paste. A great deal has been said about the filthiness of the tooth-brush. I do not quite agree with some writers on this subject, because I think it possible to keep a tooth-brush clean, though a good many are not kept so. A piece of toweling, as recommended, will do the work; it can easily be kept clean by washing, and its cost is next to nothing, as it may be taken from an old towel. Moreover, most dispensary patients do not think much of what they get free of charge, and they will take better care of a piece of toweling and use it to better advantage than a tooth-brush which is donated to them.

Dr. Eshleman. For a long time in Toronto the dispensary patients have been furnished with a tooth-paste or a tooth-powder and a tooth-brush for five cents, these brushes being bought by the thousand and distributed all over the country at cost. Even if they were sold for ten cents, the cost would be such that almost everybody could afford to have a tooth-brush. We have in the last few days been granted permission from the commissioner of health here to provide for the free distribution of brushes to the children.

Dr. White. In illustration of how the work is expanding, I received word a short time ago, following the oral hygiene campaign in the city of Detroit, where a dentist, Dr. Oakman, is the president of the board of health, that at a public meeting held there, about twelve hundred persons were present, also a representative of every local newspaper. I also received a letter from Dr. Oakman saying that the board of health had asked for an appropriation of twenty thousand dollars to carry on the campaign for oral hygiene, and that the bill passed the council without a dissenting vote. This gives some idea as to what is being done in other portions of the country.

Dr. W. W. Smith, Rochester. I wish to congratulate Dr. Proseus for the concise and ideal methods outlined for standardizing operations in dispensaries. I wish to take issue with one statement, however, namely, in regard to paying more attention to utility and permanence than to esthetics. It seems to me that this phase must be carefully considered, because a great many children go to dispensaries under protest, and we should appeal to them from the esthetic standpoint, by showing them how their looks are being improved.

Dr. Palmer said that our object should be to preserve the teeth until the children arrive at an age when they themselves can have them looked after, and until that period arrives their teeth can

be preserved by the more esthetic silicate or oxyphosphate cements.

The work in Rochester has been mentioned. Something has been done there, but it is thought by those concerned that it is still in its infancy, and that we are doing very little as compared with what should and will be done in the future. We are all praying and working for funds with which this work may be carried on in an ideal manner. At the present time, the standardization of operations and ideal conditions seem impossible, because there is so much suffering and the waiting list is so long. The relief of suffering is of prime importance, and we hope the time will come when we shall have sufficient funds and a sufficient number of dentists to take care of the necessary work, so that we may adopt a methodical way and standardize the operations. One of the main needs to this end is a superintendent who can give his whole attention to the work. Most practicing dentists are too busy to devote sufficient time to this work, and where there are so many dentists in charge of the work there is such a great difference of opinion that it is impossible to standardize it. We are hoping, however, that the time will soon come when the work can be carried out in an ideal way.

Dr. B. S. Hert, Rochester. Dr. Proseus was connected with the free dental dispensaries in Rochester for several years; previous to that time he was connected with an institution where he could take care of the inmates according to his own ideas, and those ideas as outlined are ideal, but under conditions as they exist in Rochester at present their realization would be impossible. I do not know what the situation is in Buffalo, but in Rochester we have three dispensaries in operation more or less continuously, having never yet been able to conduct them on full time. We limit the patients according to their income. The basis of this is that no patients are received from families whose income per member is two dollars or over per week. This limits the number eligible for admission very materially, but the dispensaries are crowded all the time, and we cannot take care of those entitled to our services.

Dr. Proseus said that we should be sure to save the permanent first molar; I do not believe in that doctrine to the same extent. I have advocated the extraction of the permanent first molar in the dispensaries in many cases, because in the time devoted to treating and saving these teeth when badly broken down, there can often be saved a number of quite good teeth, which would on the average be much healthier and last many years more than such permanent first molars, and which would be much less injurious to the system and cause less suffering. For one of our main objects is the elimination of toothache and the avoidance of systemic trouble as the result of abscesses which many times follow.

Dr. Proseus also advocates the elimination of the older children and taking care of the younger ones, because their teeth are not in such serious condition and thus can be more easily saved. I hold that this idea is applicable to the permanent first molar. But we can save more teeth with less trouble for the child by devoting more time to the other teeth rather than trying to save the permanent first molar in every instance.

Dr. Palmer. I would like to ask Dr. Eshleman under what department of the city he believes dispensary work should be conducted, the board of health or the board of education.

Dr. Eshleman. That is rather a difficult question to answer, and I would prefer to have someone answer it who knows more about this work than I. In Toronto, the educational department controls the school dispensaries, and the health board the municipal dispensaries. Here in Buffalo we are in the good care of the commissioner of health, whose hands are bound by the common council. In 1916 we shall have a commission form of government, and we do not know what the conditions will be then. If we could get the commission to place the control of the dispensaries in the hands of competent dentists who would

devote their whole time to the work, that I believe would be the ideal condition.

Dr. Proseus (closing the discussion). After listening to the discussion and seeing how thoroughly all the speakers are in accord with my suggestions, I do not think it will be very difficult to have those who are put in charge of such work agree on the different methods and materials. I have perhaps been misunderstood in regard to taking care of the younger children. My idea was not only to eliminate the larger cavities, but to treat the recently entered child immediately. If we do the work indiscriminately without any system, we will have an insurmountable number of cavities before us all the time. In the state industrial school Dr. Gilbert was in charge for some years, when he was in full practice. I followed Dr. Gilbert and Dr. Lowe followed me. No one could do better work than Dr. Gilbert, but he followed a system which aimed at treating the worst cases first. There are three classes in the school, in the third of which there were sometimes three hundred, but my plan was to take care of the boys as they entered. I took care of the third division in two years. By treating the boys as they enter, two or three each week, in a number of years all the mouths would be taken care of. At the end of a certain period the result would be ideal; whereas, if the work is done promiscuously, a great many cavities remain untreated all the time.

The extraction of permanent first molars will have to be left to the discretion of the operator, or to the decision of the board in charge of the dispensary. If they decide upon a plan to extract, the operator would have a definite idea to work upon.

I wish to thank you for the kind reception of my short paper, and the very gratifying discussion.

Dr. Smith. I would like to ask Dr. Proseus whether he means that the board of directors should decide upon a plan of extraction of the permanent first molar, or whether the decision should be left to the operator in each individual case.

Dr. Proseus. The operator should not bear the entire responsibility. It would probably be best to agree upon a plan after a consultation between an orthodontist, an all-round practitioner, and a specialist in high-class operative work, and then the dispensary operator should follow whatever plan they may decide upon.

Motion was then made and carried to adjourn until the evening session.

Thursday—*Evening Session.*

The meeting was called to order at 8.30 p.m., on Thursday evening, by Dr. Geo. C. Lowe, Rochester, president of the Seventh District Society.

The first order of business was the reading of a paper by Dr. Herman E. S. Chayes, New York, entitled "A Broad Consideration of the Principles Involved in Fixed and Removable Bridge Work."

[This paper is printed in full at page 783 of the present issue of the Cosmos.]

Discussion.

Dr. C. K. Buell, Buffalo. In discussing the essayist's valuable paper I want to emphasize that no post for any crown should be made so large that it will weaken the root. I have seen so many crowns placed on roots reamed out to such an extent that there was simply a tube-like shell left, and such crowns always fail. It has been my practice to use platinum posts alloyed with twenty per cent. iridium. If such an alloy is used, there is no necessity for reaming the root quite so much. A 14-gage post is the largest I have ever used. Roots will then not fracture under ordinary strain. My endeavor has always been to make the post as small as it could be made with sufficient strength. I have tried to follow Dr. Chayes' suggestions in making a movable joint for at least one end of a bridge, and this method has given me great satisfaction. I am not able, of course, to make removable bridges like Dr. Chayes, but I have been using a

slot in an inlay or crown, with a horizontal bar resting in the slot, and a bridge made in this way will far outlast a bridge resting on two fixed abutments. I would like to ask the essayist how he maintains pressure on the saddle while he takes the impression.

Dr. Chayes. Just with my hands. My assistant puts the plaster on and I hold it.

Dr. Buell. I have the pleasure of owning an instrument for paralleling abutments, which has given me infinite satisfaction, not only in bridge work, but often in small plates fastened by clasps or attachments of various kinds.

Dr. H. T. Stewart, New York. The different methods of bridge work, in my opinion, are largely a matter of personal equation. What will suit one man will not suit another. My methods are quite different from those of Dr. Chayes, but I greatly appreciate his valuable paper and admire his bridge work.

Dr. B. S. Hert, Rochester. I am sorry that those who were appointed to discuss this paper are not present, as the essayist has gone into the mathematical and other recondite features of the subject so deeply that the average dentist cannot, on such short notice, fitly discuss it. Dr. Chayes spoke of the preparation of anterior roots for crowns, and said that the beveling should be done in a definite, fixed way, but I did not understand just what that definite fixed way is to be.

I have never practiced removable bridge work to any great extent, as I believe that when bridge work is necessary, fixed bridges are usually better. If, however, made after the essayist's methods, removable bridge work is probably very satisfactory. It requires, however, a paralleling instrument such as Dr. Chayes has advised, to obtain accurate results; otherwise I think a fixed bridge should be used.

Dr. W. R. Montgomery, Buffalo. The subject of removable bridge work is certainly of most profound interest. I would like to know if Dr. Chayes has experienced any trouble from the settling of the tissues under stress to such an extent that, after these pieces are worn for a short time, the work has to be done over.

Dr. Chayes (closing the discussion). I have only to answer a few questions in closing. In reply to Dr. Montgomery's question, I would say that I have never had to make a bridge over because of settling of the tissues. If we can equalize the pressure all over the alveolar ridge, there will be no absorption or resorption, providing, of course, that a reasonable length of time has elapsed after extraction. A saddle under intermittent, limited masticatory stress produces an auxilliary pumping action which brings fresh nutriment to the tissues. Absorption occurs only when this pressure is unequal as the result of an excess at some point, and when not all of the abutments are parallel and therefore do not properly interplay with one another, or when the saddle is tipped or warped; but these conditions can be recognized before the patient is allowed to wear the piece.

In answer to Dr. Stewart, I will say that I have no great discovery to proclaim. The underlying principles of bridge work are old, but our recognition thereof has been somewhat delayed, to our own and our patients' detriment.

The sum total of clinical experience has led us to the recognition of the axiom that the abutments must be parallel. My contribution in this field consists in the instruments which I have invented, which render it possible for the average man to make the abutments parallel beyond the possibility of error.

The matter of personal equation does not hold good in mathematics and geometry. Two and two make four, no matter who does the work, and the solution of a geometric problem is the same no matter what you try to do. Parallelism means parallelism; and unless unequal stress upon the alveolar ridge is avoided, a bridge will be a failure.

In regard to preparation of anterior roots, we use the root-face as a guide and remove enough of the sides with file-cut burs or small stones to produce an obtuse angle of varying degree. This

obtuse angle varies inversely as the stress which is brought to bear upon the root. The greater the amount of stress upon the root, the less obtuse the angle. This angle can be produced with any cutting instrument best suited to the operator's hands, either sandpaper disks or small carborundum stones, or an enamel-cutting bur, providing no injury is done to the peridental membrane.

There must be intermittent stress on the mucous membrane, if the alveolar structure is to be conserved, because that limited intermittent stress supplies the intermittent pressure essential to the supply of fresh nutriment to the end tissues. The teeth receive less nutriment as the patient grows older, as the blood is not forced to the extreme end portions as in younger people. When a person has passed the age of thirty-five or forty, under the stress of modern business life, the heart needs all the help it can get by exercising the muscles of the arms and legs, thereby supporting its pumping action. This pumping action ceases to exist in the mouth after the loss of teeth, unless artificial substitutes are supplied on the mechanical principles described.

Motion was then made and carried to adjourn.

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

Regular Monthly Meeting, held February 16, 1915.

The regular monthly meeting of the Academy of Stomatology was called to order Tuesday evening, February 16, 1915, at eight o'clock, by the president, Dr. J. C. Curry.

The first item on the program was a short talk by Dr. Hermann Prinz on the new Harrison Act as it relates to the practice of dentistry.

[The trend of this talk was substantially the same as that of the article by Dr. Prinz, printed at page 413 of the April 1915 issue of the Cosmos.]

The president then introduced the essayist of the evening, Dr. F. R. Getz, New York, N. Y., who read a paper entitled "Efficiency of Dental Services and Dental Restorations."

[This paper is printed in full at page 764 of the present issue of the Cosmos.]

Discussion.

Dr. E. L. Kanaga. After reading Dr. Getz' paper I feel that we are working toward the same ideals. I was impressed with Dr. Getz' opinion on the advantage of the bandless Logan crown or Davis crown. I judge from his paper that he also admits that we are open to some criticism regarding the use of the banded crown. There is no question that the best-appearing crown is possibly the bandless type. I use that type of crown occasionally in connection with a cast base in preference to removing a root which cannot possibly be banded, and which will probably last only a few years. But such a crown at best is a makeshift, and I would hardly dignify it by calling it a crown. Dr. Getz criticizes the use of the banded crown. In my opinion, however, it depends upon the operator whether the banded crown is open to criticism or not. If we remove the enamel protection from a tooth and replace it with gold so as to protect the dentin, the ideal condition is reproduced, and under certain conditions nature is even improved upon. The slimy accumulations of mucus, bacteria, and calculus which ordinarily attach to the dentin and enamel, as Dr. Getz has pointed out, do not attach

themselves so easily to gold, and under those conditions I think pyorrhea is almost impossible. To cite an example: I had occasion, six years ago, to make a small anterior removable bridge of four teeth for a patient who was troubled more or less with pyorrhea, and I was sufficiently daring under these conditions to use two fairly loose roots, those of the lower lateral incisor and canine, as abutments. To gain additional support I put a lug around the lingual surfaces of the adjoining teeth at each end of the bridge so as to take up the incisal force. Some time afterward the patient wanted a duplicate, and, as the roots had sufficiently tightened, I made the second bridge without the supporting lugs around the adjoining teeth, and this appliance will in all probability do good service for many years to come. The tightened roots have required very little attention in the way of prophylaxis; no calculus has accumulated under the gums, and there is no irritation or inflammation—while these teeth, if left uncrowned, would probably have been lost some time ago.

In regard to crowning vital teeth, Dr. Getz states that there is room for criticism both ways. The argument for crowning vital teeth is our weakness in treating root-canals perfectly.

My only criticism of Dr. Getz' paper concerns his statement that a band does not irritate the surrounding membranes when it is properly fitted to the root. The difficulty lies not so much in the fitting of the band, but in the proper preparation of the root. If the root is not prepared properly, a band cannot be fitted so that it will not extend into the soft tissues and cause pyorrheal conditions, in the same manner as an accumulation of salivary or serumal calculus on the root. If the enamel is entirely removed and the tooth is given a slightly conical shape, the band can be driven on so that at its highest point it is in perfect contact with the root.

Every good dentist must work to an ideal. If we can properly fill root-canals and reproduce the enamel coping of the tooth, we can approach the ideal very closely. The careless worker, therefore, should not attempt to use banded crowns, though it is sometimes surprising how long crowns and bridges will stay in the mouth in spite of adverse conditions. Not so long ago, I saw a bandless crown of the old Logan type. It was set off at an almost right angle, and one side had been worn down to such an extent that hardly more than a half crown was left, and there was a perforation into the soft tissues. Yet the patient was quite positive that the crown had been in his mouth for twenty-five years. Another similar case came to my notice a short time ago: A bridge extending from the first bicuspid to the second molar was attached posteriorly to an ill-fitting gold crown which had caused the second molar to loosen and to become entirely detached from the alveolus and gum tissue. The gold crown on the first bicuspid also was loose, and the bridge could be taken from the mouth with the abutment roots. The patient had been wearing that bridge in that way for nearly a year.

One of the first essentials to make bridge work a success, as Dr. Getz has so fittingly emphasized, is a live, keen interest in it, a compelling desire to master it in its unpleasant and difficult as well as its agreeable aspects.

Dr. A. F. Jackson. The essayist advises not to make a crown without a band under any circumstances. Dr. Kanaga said that it was impossible under some circumstances to make a banded crown; I think it is possible to put a band on a badly broken-down root by retracting the gum with gutta-percha. The objection in regard to the appearance of the banded crown, in my opinion, can be overcome more easily since the advent of the Goslee teeth, because it is possible to use a crown with a facing in such a way that the entire band can be covered. Moreover, in making a banded crown it is not necessary to go so far under the gum to hide the joint between the tooth and the gum.

In regard to the question of devitalizing teeth which are to be crowned, I think that this procedure is imperative

in every case, with the exception of elderly patients in whom the pulp has receded to a marked degree.

Dr. J. V. Mershon. A great many failures in the banding of roots, in my opinion, are due to a lack of knowledge of the peridental membrane and of the anatomy of the whole tooth. In some lateral incisors, for instance, the enamel on the labial surface will extend about one-sixteenth of an inch farther up the root than on the approximal surface. The fibers of the peridental membrane are always attached just where the enamel stops, and unless the band of a crown is kept from impinging on the fibers of the peridental membrane, it will surely be a source of irritation. We should consider the anatomy of each individual tooth when preparing it for a band, and keep in mind that as soon as we go beyond the original dento-enamel junction we cross the danger line.

Dr. J. A. Standen. The essayist did not speak of the use of a pin in a banded crown. The more banded crowns I see, the more I wonder why a great many more porcelain crowns are not used. In a great majority of these crowns I believe the band is more of a detriment than a help. There is one point that we can learn, in this connection, from the operator who uses ready-made porcelain crowns, and that is thickness and length of the pin. In a great many banded crowns in which pins have been used, and which have to be removed from one cause or another, we find that the pin has practically no length, or if so, its taper is so great that the pin has no strength.

Dr. J. H. Gaskill. While fully appreciating the essayist's work. I would question the advisability or safety of the small bridges of two teeth which he has shown, with a clasp holding the bridge in place. Dr. Bonwill made this form of denture and advocated it very strongly, but I have always feared the possibility of such an appliance becoming dislodged and swallowed by the patient.

Some twenty years ago I had the opportunity of hearing one of the most enthusiastic bridge workers make the statement that he cared nothing for the pulp, that it was the root he was after, and that he destroyed pulps recklessly. I followed that teaching more or less for a number of years, and felt that the root was the more essential part, and that, for cosmetic reasons, we were justified in sacrificing the entire crown and of course the pulp if necessary. After watching these cases for twenty years or more I now doubt the advisability of that practice, as I am commencing to see the serious results which we are sometimes reaping from such wholesale destruction of tooth pulps.

Dr. J. C. Salvas. I would suggest that the essayist describe his technique of preparing roots for the reception of bands. The peridental membrane which Dr. Mershon calls attention to is indeed very important. Its susceptibility to irritation is the strongest plea against the banded crown. Gingivitis is not infrequently the result of irritation of this character. I avoid using these crowns whenever possible, although I recognize their advantages. Their one disadvantage, viz. predisposing the tissues to pyorrheal conditions, is a strong argument against their use.

Dr. Alice Norton. I would like to say that I have never found a ready-made post which in any way resembled the root of a tooth. I invariably make a post to fit the root, but never attempt to make the root fit the post. My method consists in approximately fitting a gutta-percha point to the root-canal I am about to operate upon, so that after filling the apical portion of the root, I have a good idea of the nature of the canal and a guide for shaping the post.

Dr. Getz (closing the discussion). I am glad to know that the discussers essentially agree with me.

Dr. Mershon spoke of root trimming. Conditions, of course, differ in various mouths. I think Dr. Mershon overlooked the more advanced cases, where the line of attachment of the peridental membrane has receded.

Dr. Mershon. My point is that the failure of a crown is very often the result of ignorance as to where the peridental membrane starts, and a crown forced up beyond the dento-enamel junction will necessarily impinge on the peridental membrane.

Dr. Getz. Exactly, but that line of junction varies in different ages.

Dr. Mershon. I meant to imply that the line differs in practically all teeth. I cited the lateral incisor as one of the most marked cases. On the labial surface of the lateral incisor, the enamel extends much farther than on the approximal surface. In many canines the line of enamel is a compound curve, and in some molars it is practically a circular ring. Yet we see many crowns which are supposed to fit these teeth without due attention to these anatomic details.

Dr. Getz. In other words, they fit like a silk hat pushed over a turnip, *i.e.* the circumference of a band large enough to pass over the end of an untrimmed or poorly prepared root is too large at any point beyond the largest part of the root. In preparing roots I try to produce an inverted truncated cone with the larger base at the margin of the peridental membrane. In cases where the gum has receded and the dento-enamel junction has been exposed we cannot avoid a certain amount of blood in preparing the root so that the uppermost margin of the band shall as closely as possible approximate the relationship of the enamel to the gum attachment, even though it is above the original line of attachment. In other words, there shall be, as far as possible, no projection or sharp edge of the band extending away from the periphery of the root. This is a rather difficult operation, but it can be carried out successfully with some application.

Dr. Norton mentioned the important point of making posts for the canals of anterior teeth the roots of which are of variable shape, length, and thickness under the gum line. The post should be made to fit the root. The teeth which I showed at the clinic this afternoon illustrate the impossibility of using large posts in crowns for bicuspids, and the great danger of making perforations in reaming the canals for the reception of posts strong enough to support unbanded crowns. Long and thick posts always bring the operator in dangerous proximity to the periphery of the root. It is surprising how many teeth with crowns of average size taper very rapidly to a thin root or a short and pointed root, and besides present concavities on both sides. I showed one or two second bicuspids with such roots this afternoon in which the fitting of a large post would have been impossible. In a banded crown, of course, a smaller pin is required, and I have even seen crowns of medium width with well-fitted bands and without pins, which wore for five or six years without loosening. The post acts more as an anchorage for the crown, and with a band of some strength the stresses brought to bear on such a crown are equally distributed to all portions of the root with no danger of splitting. This applies to cases in which I use comparatively small and often tapered pins, and in which I have never noted any breakage. This observation again emphasizes the thought that in so far as we can save any tooth structure, either inside or outside the root, we are practicing a provident conservatism, because in later years conditions may arise when we may have to remove a crown and incorporate a root in some larger scheme of bridge work.

Dr. Gaskill spoke of the danger of swallowing bridges. I have known that to happen. In one instance a platinum and porcelain bridge attached with a Griswold stud and capsule, which had not proved very practical, was swallowed, but the patient did not die. Such accidents are no more an argument against the insertion of bridges than the fact that people fall down stairs is an argument against the construction of stairways. There is always more or less danger of accident when a patient wears a denture, but I do not think that we can possibly assume full responsibility, and that a certain amount of responsi-

bility for care and caution rests upon the patient. The swallowing of a clasp appliance would be an unfortunate accident; but I do not think that the patient would be any worse off than if he swallowed an entire plate. This is one of those responsibilities that devolve upon the patient, and I would not hesitate to construct any type of removable bridge if I considered that the health of the mouth and the preservation of the natural conditions of the individual teeth were best safeguarded by such an appliance.

We agree essentially in being reluctant to sacrifice the pulps of teeth. While I resort to devitalization without any compunctions if my judgment warrants such a procedure, still the first aim is to preserve the pulp, especially in young patients.

As to the technique of trimming the root-ends for the band, I use flame-shaped Ivory burs of various sizes with the right-angle handpiece a great deal. In many cases molars which are to be crowned are already in a broken-down condition, and there is little difficulty in preparing the root. The enamel breaks readily, and the dentin, having been softened, easily permits of producing the cone shape spoken of. In certain cases we can slip the bur around the cervical margin and take off the layer of enamel without any difficulty or pain to the patient, leaving a certain amount, of course, to be removed by scalers. Strange to say, in certain cases and under certain conditions, where it is necessary to go below the attachment of the peridental membrane, the use of the burs produces less bleeding than the trimmers.

Dr. Curry. What material do you find most suited for dowels?

Dr. Getz. I have been using a great deal of platinum for this purpose with up to twenty-five per cent., usually however fifteen per cent., of iridium. In the last two or three years I have been using plain round clasp metal wire, and I have noted no breaks. In most cases I think clasp metal in combination with a good band serves as well as iridio-platinum. Of course, for a baked or porcelain crown I use platinum entirely, not because of the additional strength, but on account of its high fusing-point. In making lugs I use clasp wire for the sake of its strength, and I find little more breaking than with platinum. Where there is not so much space, however, I prefer platinum with a high percentage of iridium.

Dr. Mershon. Have you tried tungsten?

Dr. Getz. No. I tried to make an alloy of gold and the metal used in hardening iron, vanadium, but I was not very successful with it.

Dr. Gaskill. I move that a vote of thanks be extended to Dr. Getz for coming to Philadelphia and giving us this paper, and also the clinic this afternoon.

The motion was carried, and a rising vote of thanks was extended to Dr. Getz.

The society then adjourned.

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PHILADELPHIA, JULY 1915.

EDITORIAL DEPARTMENT.

THE MASSACHUSETTS DENTAL LAW.

UNTIL the recent passage of its new dental law, now in effect, the State of Massachusetts enjoyed the distinction of being one of three states which permitted any applicant, who could pass the test imposed by its board of examiners, to practice dentistry within the borders of the commonwealth. In a circular issued by the Massachusetts Civic League, soliciting professional support for a proposed act which is now law—framed with a view to remedy among other things the defective feature of the previous law which permitted non-graduates to take the licensing examination—the following clear statement of the importance of requiring graduation from a regular course of training in a reputable dental educational institution is set forth:

> Candidates for a certificate to practice should have had some experience. The only safe and legal way to get experience is in a dental

school. Yet Massachusetts does not require a dental school degree, not even time spent in a dental school, while practically every state in the Union, Hawaii, the Philippines and Porto Rico do require a dental degree. Massachusetts thus endangers her people by licensing those who are untrained or who have secured their training illegally. This is a serious responsibility.

It is not a matter of pride to live in a state which may be used as a dumping ground for those not allowed to practice elsewhere. But that is what it amounts to. A group of men in New York are advertising a special course for unregistered dentists in connection with which they point to Massachusetts as one of the states "open without diploma." There are only two other states which may be thus classed, and one of them is now trying to put through a law similar to what we are seeking.

The soundness of the foregoing contention is so generally admitted that it may be accepted as having long since passed the debatable stage. In view of the fact that practically all of the states and territories, as indeed most civilized nations, have long ago taken the legal position that only graduates of reputable dental educational institutions are eligible for admission to the state licensing examination, the marvel is that Massachusetts should have delayed so long in adopting the same generally accepted standard.

It is probably true that opposition to a dental college diploma standard in this case, as in others, during the formative stage of public and professional opinion with respect to this matter, arose from a prevalent repugnance toward anything that savors of interference with what is regarded as individual right to acquire a livelihood, and because a state board examination was deemed a sufficient safeguard of the public health as a barrier to the entrance of the incompetent upon dental practice. But, while a state board examination *per se* may constitute such a safeguard on theoretical grounds, it falls short in practice, for at least two reasons—first, the inadequacy of any test yet devised by any group of men constituting a dental examining board for determining the practical fitness of a candidate to practice dentistry; and second, the unavoidable defects of our educational system, by which under the best possible conditions a certain percentage of men are graduated who should not have been graduated. In order, therefore, that the public shall be safeguarded from the evil results of incompetence in the dental practitioner, and the medical practitioner as well, both the college course with its attendant examination tests, and the state licensing examinations by which the output of the colleges under-

goes revision by an extramural board acting in the interest of the state, are practical necessities.

Massachusetts has been slow to grasp this fundamental principle; indeed, if we are to judge from her new dental act, she has only partially grasped it even now—grasped it as one does a nettle, or in a "stiefmutterlich" manner, as they expressively describe similar attitudes in Germany. While the new law expressly provides that all members of the examining board must have been graduated from a reputable dental college, yet the law still permits the licensing of non-graduates, and thus legalizes a type of practitioner who is *ipso facto* forever disqualified from service on the board of examiners of the state. It is difficult to understand what considerations could have determined the framers of the act to deal with this important point in such a fast-and-loose manner. Section 2 of this act provides that—

> Any person twenty-one years of age or over and of good moral character, who is a graduate of an accredited high school or presents proof of an equivalent training, and has received a diploma from the faculty of a reputable dental college as defined in this act, shall, upon fulfilment of requirements for applicants as hereinafter specified, be entitled to examination by the board of dental examiners; *provided*, that a person who has spent three years in a reputable dental college as herein defined and has successfully passed all examinations of the first and second years, but has not received a degree, may, at the discretion of the board, be examined. If found competent, said applicant shall be registered by said board and shall receive a certificate of registration signed by the members of the board, which shall be *prima facie* evidence of the right of the holder to practice dentistry in this commonwealth.

That is to say, while providing that a dental college graduate may become an applicant for license, provision is also made for granting the same privilege to the college student who has failed to pass the final examinations of the third year of his college course. The glaring inconsistency of such a provision suggests the thought that it may have been introduced to take care of a "special case," and that the "special case" had a "pull."

The conditions for reputability of a college which the act imposes are as follows:

> First: It shall be chartered and authorized by its charter to confer degrees of doctor of dental medicine or doctor of dental surgery.
>
> Second: It shall deliver a full course of lectures and instruction by a competent faculty and corps of instructors, said course to consist of not

> less than three separate academic years of not less than thirty-two weeks of six days for each week, and shall require each matriculate to be a graduate of an accredited high school or to present proof of equivalent training.

Unless dental education is amenable to the factory labor laws of Massachusetts, the act should have specified the hours per day as well as the days and weeks of the academic year in order to prevent attempts at evasion of the standard of reputability created by the new dental act; and, as it is, no provision for the Saturday early closing hour is made. But the most serious problem which this clause of the act leaves unsettled is a definition of the meaning of the phrase "a full course of lectures" required as evidence of reputability on the part of the college in order that its graduates may be eligible for the licensing examination in Massachusetts. What is a "full course of lectures," anyhow? The act does not specify nor does it reveal what is meant by "an accredited high school." Accredited by whom and for what? It would seem that the gravity of these problems had created a degree of uncertainty in the minds of the framers of this remarkable document, for the closing section provides that "This act shall take effect upon its passage, except that the educational requirements for candidates shall take effect one year from date of passage." This will give much-needed opportunity to consider these basic problems, and perhaps by the end of the year some sort of rational educational standards will be devised and put into effect; in the meantime we assume from the phraseology of the closing clause that no educational requirements will be imposed upon applicants for license in Massachusetts.

Notwithstanding the inconsistencies of the act with respect to educational standards, its framers had no doubts as to what constitutes the practice of dentistry nor misgivings as to the seriousness of the offense caused by its unlicensed practice. The act says:

> Any person who owns or carries on a dental practice or business, or who by himself, by his servants or agents, or by contract with others, shall perform any operation on or make examination of, with the intent of performing or causing to be performed any operation on the human teeth or jaws, or who shall describe himself by the words or letters "Dentist," "D.D.S.," or other words, letters, or title in connection with his name, or who shall advertise by sign, card, circular, pamphlet, or newspaper, or otherwise indicate that he, by contract with others, or by

himself, his servants or agents, will perform any operation on or make examination of, with the intention of performing or causing to be performed any operation on the human teeth or jaws, shall be deemed to be practicing dentistry within the meaning of this act.

This sounds suspiciously like the work of a lawyer, a criminal lawyer more particularly—one saturated with reverential respect for the formal and involved phraseology of the older forms of criminal indictment, but with an inadequate conception of the eternal fitness of things and the adaptation of means to ends. Henceforth in Massachusetts it will be a criminal offense for a mother to look into her child's mouth when complaining of toothache, with a view to taking him to the dentist, unless and excepting she has previously complied with the other provisions of the law and received a certificate from the board of dental examiners permitting her to practice dentistry in the Commonwealth of Massachusetts.

The previous law was defective in the particular that it permitted non-graduates to take the licensing examination; the present law is an attempt to remedy that defect, but after much study of the situation we are by no means sure that the proposed remedy is not worse than the disease it is intended to cure. Therefore, while we applaud the attempt as an attempt, we deplore the result, which exhibits marked indications of legislative neurasthenia probably superinduced by concession to public or professional prejudice;—so that, under all the circumstances, we hasten to encourage our Massachusetts *confrères* by recalling to their minds the old adage, "If at first you don't succeed, try, try again!"

Bibliographical.

Die Erdsalze in Ihrer Bedeutung für die Zahnkaries. Zugleich ein Beitrag zur Normalen und Pathologischen Anatomie des Zahnschmelzes. [Mineral Salts in Their Significance in Dental Caries. Also a Contribution to the Normal and Pathological Anatomy of the Dental Enamel.] By Hofrat Dr. med. et phil. O. Walkhoff, Professor at the Royal Bavarian University, Munich. With 36 photomicrographs. H. Meusser, Berlin, 1913.

In the worldwide combat which is being waged against the universal scourge of dental caries, attempts have been made to improve the hardness of the hard dental tissues by rational nutrition based upon the principles of the physiology of nutrition, thereby to render the teeth more resistant to extensive caries. The two chief means of nutrition, bread and water, have been subjected to searching inquiries in the hope of staying the progress of dental caries by chemico-physiological means, overlooking entirely the question as to whether the enamel of erupted teeth is subject to any and to what vital phenomena. Walkhoff has shown that every enamel defect offers a point of attack for dental caries in man, and that, while in the large anthropomorphous animals defects in the formation of the enamel are found similar to those which exist in man, they become victims to caries only if given human food which, owing to its ready chemical change, sets up caries in places especially suitable for the retention of food débris. He therefore admits the importance of the mother's health and rational nutrition before the child is born, also the favorable influence of rational nutrition of the child upon the formation of the enamel and its resistance, but he scouts the enthusiasm of some observers who hope to improve the structure of the enamel and to enhance its resistance to caries in later or even adult years by the use of bread or water containing a large quantity of mineral salts. The best guarantee against the ravages of dental caries Walkhoff sees in the rapid and universal adoption of a rational oral hygiene, and in the timely and correct treatment of this disease, which can no more be wiped out than the modern civilization to which it is largely due.

The conservative standpoint taken by the writer and his painstaking studies into the nature and genesis of dental enamel in man and animals, illustrated by beautiful photomicrographs, characterize his book as one of the most noteworthy and enlightening of recent contributions to the vexing problem of dental caries.

Zahn- und Mundpflege. [The Care of the Mouth and Teeth.] By Hofrat Dr. med. et phil. O. Walkhoff, Professor at the Royal Bavarian University, Munich. With 30 illustrations. (Vol. XI of Max Hesse's Library of Modern Knowledge.) Leipzig.

Among the many treatises which within the last few years have cham-

pioned the cause of oral hygiene, this little book deserves a prominent place. It is intended to carry the gospel of oral hygiene to all classes, and by observing a happy medium between popular instruction and scientific argumentation, it fulfils its mission admirably well. Enough of the anatomy and physiology of the oral cavity and the teeth is offered to explain interestingly the diseases of the mouth, their causes, symptoms, and sequelæ, and to drive home the necessity for personal care of the mouth, for which a rational *régime* is suggested, and for treatment by the dentist when indicated. The question of national economics is also forcibly emphasized, rounding out this booklet into an attractive and reliable guide to personal and national health, which should appeal to the man in lowly walks as much as to the missionary in oral hygiene.

Aerztliche Studienreise nach Amerika. [Medical Study Travel to America.] By Prof. W. Pfaff, Leipzig. With 53 illustrations. Berlin, 1913.

This amiable little book, which is a reprint of the writer's rather elaborate diary kept during the German Medical Study Travel to America in 1912, shows in a most pleasant manner the possibility of a representative of a foreign nation understanding the "Kultur" of another, if he is only willing to cast aside prejudice and to cultivate the receptive mood. Dr. Pfaff, whose lovable personality no doubt remains in the memory of many American colleagues who had the pleasure of meeting the members of the small group of dental teachers and practitioners who participated in the Medical Travel of 1912, has seen American institutions and life with a clear eye, and has taken them as they are with that unbiased mind which inquires into what is and why it is so, but not why it should be different. The scope of this diary is by no means confined to dental observations only; rather do we hear in these vitascopic observations the sympathetic voice of "a willing learner of all, and lover of all," to use a Whitmanian phrase. The writer's own snapshots tastefully arranged add a particular charm to this booklet, which is a refreshing token of the sometimes so sadly beclouded fact that humanity and science have but one common fountainhead. R. H. R.

REVIEW OF CURRENT DENTAL LITERATURE.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

Some Phases of Pyorrhea Alveolaris. By L. A. MERRIAM, M.D., OMAHA, NEB.*

In discussing a *phase* of pyorrhea alveolaris almost universally neglected by dentists and physicians, I do so to accentuate the great value of living correctly as a basis for all treatment, whether medicinal or otherwise. A few preliminary facts and principles may be appreciated, as a basis for my teachings. Complex proteins exist in *the cells of the body*, in various foods, both animal and vegetable, as well as in the structure of bacteria. All true proteins contain a poisonous group, that chemically and physiologically are similar, if not identical. In the disrupting of the protein of the cell, in the process of wear and repair, both during the elimination of used material as well as in the change of protein supply to unite in the cell life, poisons may be produced by imperfections in the process. In the normal digestion of proteins, the poisonous peptone produced is rapidly changed to amino-acids, and these are not poisonous. If the body within is contaminated to a sufficient degree to allow the invading bacteria to live and develop, the protein of the food and the protein of the various tissues of the body are changed into the proteins of the assaulting bacteria, and these proteins become poisonous by the generation of their ferments.

All living cells grow by means of their own digestive ferments, and these must act upon the pabulum within their reach. The invading bacterial cell dies in a perfectly healthy body, for the protein of normal foods and tissues has sufficient resistive power to prevent the bacteria from digesting them, or from converting them into its own form of protein, which contains many split chemical products that are poisonous, and about which, in detail, very little is known. Then again, some of these twenty or more known amino-acids may be converted into highly poisonous substances when vital or electrical energy in the body is deficient.

The chemistry of digestion. The proteins of foods we eat are not identical with the proteins of our bodies, and, as foreign proteins they are broken into peptones by the digestive juices, and then put together after the model of the animal to which the feeder belongs. In this normal process the poison of the peptone is destroyed, and the body nourished and built up. That is to say that man is immune when the proteolytic enzymes destroy the poisonous group. These normal enzymes digest the proteins, but differ in their chemical composition, and this is the cause of their potent action, due to the high percentage of the diamino bases. At least this is true of the soluble ferments, such as the amylases, proteoses and lipases. Most soluble ferments are destructive in their action. Most insoluble ferments are constructive, by which simple chemical substances are converted into the complex proteins of the cell itself. It is well for us to remember that digestion takes place in the blood stream, and also in the cells of the body.

If the chemistry of digestion was better understood by physicians they would readily realize the great damage caused by overcharging the system with chemical and biological waste products, and an intake of foods not needed in the maintenance and development of this beautiful physical and mental machinery we term the human body. I have been writing and teaching a philosophy of health, and how to avoid disease, for more than a quarter of a century, and the day is at hand when physicians will realize the cor-

* [This paper, which was read before the Omaha-Douglas Co. (Neb.) Medical Society, is here printed *in full*, through the courtesy of the *Medical Council*.—ED. COSMOS.]

rectness of monistic evolutionary and scientific philosophy, as applied to the care of the body in health and the proper method of restoration of health when lost. Then will the countless superstitions of bygone centuries and the medical commercialism of today be laid aside, and the people be taught the gospel of scientific living.

Pathology of the disease. This disease, pyorrhea alveolaris, so familiar to many dentists, and to some physicians, known usually as Riggs' disease, is a suppurative inflammation of the root membrane of the tooth, in relation with the connective tissue of the gums beneath the mucous membrane. Its primary cause is an auto-intoxication, though its active and apparent cause may be traumatic. Like all ulcers and most skin diseases, it is nature's effort to eliminate waste matters and various poisonous preparations that could not be, or have not been, thrown out through the natural emunctories. Some chemical or electrical change has taken place in the constituents of the blood and cells, either by influences of environment or by internal influences of poisons produced by an excess of foods not needed and not used, or by a wrong combination of foods, or an excessive accumulation of waste matters of tissue change in the processes of wear and repair of the body, that have not been eliminated, and that by their presence and long-continued chemical action have irritated, damaged, and poisoned cell life and caused degenerative changes to take place in the cellular structure of the teeth or the parts contiguous thereto.

The rôle of the endamœba. The environmental influences of germ life are important *secondary* factors in this disease, both in its aggravation, or intensity, as well as in its prolongation. But since there are not many toxic germs that can live and develop in a normal healthy body, and perhaps not any, as many investigators affirm, we are safe in saying that germs do not constitute to any large degree the *primary* cause of this disease. As a profession, we have made too much out of the so-called theory of germ diseases that the facts do not warrant, and we have overlooked the essential primary factor of auto-intoxication in most diseases. Hence the treatment has been faulty, because we have directed our efforts to removing the results of primary influences that we did not appreciate. When we recognize the fact that the phenomena of nature are best explained as an expression of the great Infinite Mind, and that Nature's method of work is known as the "law of evolution," and as disease is a part of Nature's processes, it is right for us to look to the great law of evolution for an explanation of these pathological processes. And since, in accordance with this law of Nature's methods, disease is always a change in cellular structure or function from a higher or more developed type to a lower form of tissue, from a less organized to a more simple and more organized kind of tissue, it can only be explained by calling the tissue changes a reversion, in which both structure and function retrace in an inverse order the steps they went through in their elaboration or development.*

Removing the cause. More important than any known medicine or drug is the removal of the primary causes that damaged the cell life and produced this reversion of tissue, enfeebling the defensive power of the animal body, thereby permitting low forms of germ life to still further damage tissue that in a normal or pure state of the blood would have been opposed and successfully resisted by the inherent protective power of the tissues of the body. Germs will not develop in an unsuitable medium, nor will a person contract so-called infectious diseases if the normal resistive power of the blood is kept up to a high standard.†

Pyorrhea alveolaris is a leakage from an organism that is overloaded with products that cannot get out through the usual channels of elimination. It may be said to be nature's effort to defecate through the mucous membrane and tissues surrounding the teeth. If the skin is kept in a vigorous condition, so that the two and one-half million sweat tubes and glands perform their full amount of work and eliminate from one to three or more pints of liquid poisons that are usually cast out as insensible perspiration each day of twenty-four hours, and the breathing is suffi-

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* See "Degeneration the Law of Disease," by L. A. Merriam, M.D., *St. Louis Courier of Medicine,* November 1884.

† See "A Poisoned Blood Stream," by L. A. Merriam, M.D., *New York Medical Journal,* August 24, 1912.

cient to massage or activate the liver, and at the same time to thoroughly oxygenate the blood, while the kidneys and the intestines are kept in an active and healthy condition, and a proper intake of foods is provided for, and other methods of correct living are followed, then there will be a normal body and a healthy individual that can resist any and all germs and unfavorable kinds of environment. This, in a few words, is the primary cause of pyorrhea alveolaris as well as nearly all other diseases, and here I will especially instance all forms of *cancer*.

Treatment. I shall not attempt to discuss at length the various methods of treatment, as the time at my disposal will not permit. I will therefore speak only of the first grand essential in the treatment of such cases. It is wrong to think the person must be fed so much and so often, in many forms of disease —as physicians say, to keep up his strength. Absolute deprivation of all kinds of food except water, for from five to eight or more days, is the great essential in the beginning of the treatment toward purification of the body within. Water in large quantities must be drunk, and the colon and rectum thoroughly and completely emptied every day, for fasting without purgation is toxemia. This process of fasting must be supervised every day by a physician who knows how to manage the case. It must not be left to the patient. The purpose of the fasting is to relieve the digestive system of the duties with which it is ordinarily taxed, and to confine the work of the blood stream to the task of carrying off effete and broken body cells and chemical matters resulting therefrom. It is strange that medical literature contains so little as to the value of fasting, or how to care for a patient while he is taking this treatment. Yet there is no better way to purify the whole organism and prepare the body for the necessary adjuvant measures that may be called for later in the case. No acute infectious disease can be properly treated without fasting from three to ten or more days. By this method assimilation is cut short and elimination very much increased. During this fasting time I usually give small and frequently repeated doses of the amorphous aconitin during the afternoon, to produce free sweating and elimination. A daily warm bath is often advisable and agreeable to the patient. The fasting should continue until the coating of the tongue (usually in evidence while fasting) has entirely disappeared. This varies in different cases from the seventh to the fifteenth day, and in some cases even to the twentieth day or longer. But if you desire to win success, this rule must be followed.

The water-drinking must be carefully supervised, using judgment in giving detailed directions, which will need to be varied in different cases. In breaking the fast, specific and variable directions must be given, because no two patients are exactly alike, and set forms of advice are out of the question. Only a large experience will enable the physician to act wisely and win an enduring success. Generally, when breaking the fast the juice of an average orange is enough for the first meal. Fruit juices and milk, carefully increased, will serve the purpose for the first week. Man cannot live and keep well on pure protein and carbohydrates alone. He needs various fruits and vegetables to obtain the necessary juices and food salts required for normal physiological functioning.

Local treatment. I do not disparage the exciting or active causes that may have been the apparent factors in the beginning of this disease, nor do I overlook the local treatment, or the presence of various germs that often add to the severity as well as the continuance of the disease. Let us not forget that a chief cause of many diseases is auto-intoxication from food poisoning and deficient elimination, and the essence of cure, now so much neglected, is the purification of the body within by a correct philosophy and living the life in harmony with chemical, physiological, and psychological law.

When the preliminary treatment above indicated is carefully and thoroughly followed out, then the patient is ready to receive his daily dose of from one-half to one grain of emetin, with other well-known measures, and you can be assured there will be few or no relapses.

I have only attempted to cover *a very much neglected phase* of the treatment, to which I ask your best attention and kindly consideration.

[*Journal of the National Dental Association*, Huntington, May 1915.]

ARE ENDAMŒBÆ IMPORTANT FACTORS IN THE ETIOLOGY OF PYORRHEA ALVEOLARIS? A STUDY OF THEIR HABITS.

By Dr. W. A. Price and LeR. P. Bensing, Cleveland.

The unusual interest shown by the dental profession in studies regarding the etiology of pyorrhea alveolaris since the publications on the endamœba buccalis and emetin treatment by Drs. Barrett and Smith, has induced the Scientific Foundation and Research Commission of the National Dental Association, under the director of researches, Dr. W. A. Price, to examine the evidence, both favorable and unfavorable, as to the specific character of the endamœba and emetin, and Mr. Bensing's praiseworthy researches, which are illustrated by a beautiful series of photographs of endamœba buccalis and endamœba kartulisi, showing their progressive changes, have led to notable conclusions. Owing to the fact that the evidence indicating that endamœbæ are the chief causative factor in pyorrhea alveolaris is largely circumstantial, being based, in a great part, on studies of the endamœba histolytica of amœbic dysentery, and since the evidence against this conclusion is also quite incomplete, judgment should be withheld until further researches shall have established a sufficient number of the following data:

(1) The successful production of the lesions of pyorrhea alveolaris by inoculation with endamœba, according to Koch's law that (*a*) an organism if it causes the disease must be present in all cases; (*b*) the organism shall be isolated in pure culture; (*c*) a pure culture, when inoculated into a susceptible animal, must produce the disease; (*d*) the chemical products must produce the same alterations.

(2) Or the successful production of the lesions by inoculation with some other organism or organisms or by some other means.

(3) Or the demonstration that the endamœbæ of the mouth are non-pathogenic, and are incidental or helpful inhabitants of the oral cavity as scavengers, not only harmless of themselves, but not producing either toxins or harmful enzymes.

(4) If the endamœba buccalis is the chief causative factor in pyorrhea alveolaris, why is the endamœba kartulisi found alone in so many of the typical cases?

(5) The establishment of the rôle of emetin, including a close differentiation between its amœbicidal and its bactericidal actions.

(6) The determination as to whether the beneficial action of emetin is that of an amboceptor, acting upon the bacteria or protozoa with their protein and toxin contents (the toxiphor group) through the agency of the complement, and also whether the action of emetin is that of a complement, as in the case of lecithin with snake venom.

(7) A determination as to what is involved in so-called bacteremia, which is clinically so common as a result of instrumentation and of certain medications, and is this action bacteremic, septicemic, or toxemic?

(8) The establishment of the precise local tissue changes involved in the development of the lesion of pyorrhea alveolaris and of the successive processes constituting its repair.

(9) The establishment of the precise rôle played by instrumentation in the process of repair of pyorrhetic lesions, and the significance in this process of the removal of foreign material, bacterial plaques, and degenerating tissue; also polishing of surfaces, local stimulation of circulation by frequent massage, etc.

(10) The development of a means for the reattachment of vital tissue to dead and denuded cemental surfaces of roots.

(11) The establishment of the rôle of pyorrhea alveolaris pockets as culturing-places for pathogenic organisms, as those of the streptococcus-pneumococcus group, which from this lesion as a primary focus affect other organs and tissues of the body, and the establishment of the symbiotic effects of the organisms on each other.

(12) Granting that the endamœba is the causative factor of pyorrhea alveolaris, and that emetin hydrochlorid is a specific for it, why has no pyorrhea pocket, of the many cases treated, been more greatly modified in the way of repair than the more or less marked improvement of the following factors —the quantity of pus flowing; the relative quantity of micro-organisms growing in the pockets and the general tonicity of the surrounding connective tissues, with practically no considerable change within several months of the lesion of the alveolar bone surrounding the tooth?

(13) And chiefly, by the establishment of

a mass of circumstantial evidence bearing on the above and related problems, which shall be so carefully interpreted and tabulated that it will indicate the probable answers to most all of the above questions, before they can be clinically and technically established. This will best be done by as large a number of skilled observers as possible, including those skilfully treating pyorrhea alveolaris either as a local lesion, as a systemic lesion, or as both; those treating other diseases primarily, but also observing competently the effects on local mouth lesions, and those studying by intensive methods in pathological and bacteriological laboratories, etc., sending reliable statements of their observations and findings to some central committee or organization, such as the Research Commission of the National Dental Association, for classification and publication—a considerable quantity of which has already been received.

To facilitate observation and the collection of data by the average practitioner a simple technique is indicated in detail.

[*Proceedings of the Royal Society of Medicine, Odontological Section*, London, March 1915.]

THE INFLUENCE OF THE THYROID GLAND UPON DENTAL CARIES. By H. E. Waller, Birmingham.

Since students of the etiology of dental caries have turned their attention to the ductless glands and their possible influence upon the production of that disease, some striking observations have been recorded which, in conjunction with the immense amount of previously collected data, may justly make us hopeful of the ultimate solution of this vexing problem. Waller, whose name is prominently connected with the study of dental caries, takes, in brief, the following view of the problem: Dental caries can only occur when the saliva is defective in alkalinity, this defective alkalinity being the result of errors in calcium metabolism. Such errors depend not on deficient supplies of calcium, but either on defective power of assimilation or on excessive excretion. Although dental caries is prone to occur at times when there is an obvious strain upon calcium metabolism, yet uncivilized races are able to pass through these times unscathed, though we cannot do so. Brain work is the keynote of civilization, and as brain work is dependent upon adequate thyroid activity, it is probable that the increased thought demanded for life under modern conditions and by modern education is responsible for increased thyroid activity. This increased thyroid activity either causes increased elimination of calcium, or perhaps the interaction with the other ductless glands prevents the proper assimilation of calcium, and thus leads to defective alkalinity of the saliva, and so permits the occurrence of dental caries.

[*Deutsche Zahnaerztliche Wochenschrift*, Berlin, April 17, 1915.]

THE FAILURE OF SUBSTITUTES FOR NOBLE METALS IN DENTAL PROSTHESIS. By Zahnarzt E. Silberman, Breslau.

The substitution of cheaper alloys for gold in dental prosthesis seems justified by the desire to afford poor patients the benefit of metal appliances over those of rubber. In the use of gold alloys the consideration of color is secondary only to that of durability. For plates, therefore, 18- to 19-k. gold is used, since gold of a lower karat oxidizes, and gold of a higher karat is unsatisfactory in regard to hardness and elasticity. The addition of a higher percentage of copper increases the hardness, but also the tendency to oxidation. In clamps, a high percentage of copper is inevitable, but in plates or bridges its use must be limited. Gold of 14-k. invariably discolors, while 8-k. alloys are no better than German silver, after they have been worn in the mouth for some time. The oxidation of metals largely depends upon oral conditions, the composition of the saliva, and the cleanliness of the patient. Since gold alloys below 14-k. may be considered as worthless, especially if palmed off as gold work, all those substitutes which are offered in the market as containing a high percentage of gold are to be shunned. Colorfast alloys are made with a zinc or aluminum base, and are suitable for casting purposes, but they cannot be satisfactorily swaged or soldered, since with a low fusing-point they combine a lack of hardness and elasticity. Moreover, cases of metallic poisoning, as that reported by Harnack (see Review, Dental Cosmos, March 1915, p. 349), indicate caution, as copper, especially in the presence of carbon dioxid, gives off the toxic cupric oxid.

As a substitute for gold in plates, alumi-

num or magnalium is best suited. These metals can be satisfactorily cast, and a plate made without rubber combination, either by using Steele's teeth or by providing retention boxes. In casting teeth to aluminum, great care is required, owing to the deleterious influence of aluminum upon platinum. On the whole, the use of any other metal than gold and aluminum in plate work is indicated only in cases where the mucous membrane exhibits an intolerance to vulcanite, or where a vulcanite plate cannot successfully withstand the force of mastication. In the former case, a low oxidizable alloy would not afford any relief; in the latter case a base-metal plate cannot take the place of a gold plate, since after some wear the base metal becomes brittle, especially at the soldered portions.

In bridge work, gold alone deserves consideration from both the esthetic and the economic point of view. In individual crowns which do not have to bear much stress of mastication, German silver is no less satisfactory than other cheap alloys, though in many cases a large amalgam filling strengthened by a German silver band will be preferable. For cast inlays, gold is indispensable, as no other metal possesses the qualities required for this purpose, aluminum being too soft.

As long as science has not discovered an alloy which possesses the remarkable qualities of gold or platinum, vulcanite will retain the place which it has occupied for decades, to the benefit of the majority of patients.

PERISCOPE.

Device for Heating Rubber.—Rubber heated on a clean pasteboard instead of a metallic cover will not stick thereto.—J. C. RICE, *Oral Health.*

Emergency Repair of Rubber Bulb of Chip-blower.—The break in the rubber bulb of a chip-blower may be covered with a thin layer of cotton, which is painted with collodion and allowed to dry. This repair will last until a new bulb can be secured.—J. S. WALKER, *West. Dental Journal.*

Melting Aluminum.—In melting aluminum previous to casting, new, clean ingots should always be used. The metal should never be overheated, and when fusing, it should be slightly agitated with the end of an ordinary slate-pencil from time to time, and all dross removed, until a smooth, clean surface presents, after which the casting should be made, observing only moderate speed in doing so, as the metal remains liquid for some moments.—H. J. GOSLEE, *Dental Review.*

Leucoplakia.—Leucoplakia lesions are painless, and may be overlooked by the patient unless they become complicated with cancer. It has been observed that carcinoma frequently has its beginning in the site of an old leucoplakia patch. Since this is true, an early diagnosis should be made, which is clearly within the province of the dentist, who may note it before the patient. The patient should be advised to avoid all irritants, especially tobacco and alcohol, prophylaxis should be instituted, and soothing mouth-washes prescribed. The treatment of the disease itself should be relegated to the oral specialist or family physician. In cases of known syphilis, anti-syphilitic treatment is indicated.—J. P. BUCKLEY, *Dental Summary.*

Destruction of Caoutchouc by Microbes.—Microbes do not attack commercial caoutchouc which is kept in dry air, but when a small amount of moisture is present, certain bacteria and molds derive nourishment from the albuminoids, resins, and sugars which the rubber contains. Some microbes form on the caoutchouc spots of various colors, red, yellow, black or brown, but the rubber is not materially altered thereby. On the other hand, two species of actinomyces, very common in garden earth and in canals, actinomyces elastica and A. fustus, assimilate the hydrocarbons of the caoutchouc, and are in consequence capable of modifying its properties in such a way as to deprive it of all commercial value.—*Revue Scientifique,* per *Brit. Dental Journal.*

Aluminum Base-plates.—The following are the reasons why swaged aluminum base-plates are more susceptible to disintegration than cast base-plates. The purest and least contaminated aluminum to be had is not attacked by the oral secretions. Chemical action can only attack the metal through impurities embodied in it. Aluminum in ingot form, it is reasonable to suppose, is uncontaminated, or the least contaminated. Aluminum rolled plate may and undoubtedly does become contaminated. It is rolled in iron; it is swaged between base-metal dies while saturated with oil, and impurities are practically driven into the surface of the metal, there to be attacked and eaten out.—R. C. Brophy, *Dental Review.*

Relieving Pain Following Extraction.—A good remedy for relieving pain after extraction and to assist in tissue repair is the following: Oil of cloves, dram ii; tincture of aconite, drops iv; menthol crystals, grains xi. This is applied to the gums with a pellet of cotton several times a day till all pain is gone, and soreness is relieved.—J. Anderson, *Dental Digest.*

To alleviate pain after extraction, equal parts of guaiacol and glycerin on a pledget of cotton carried into the socket and then removed are employed advantageously.—A. A. Goldman, *Dental Digest.*

Europhen 1 dram and orthoform 2 drams, made into a paste by the addition of petrolatum and placed in the socket by means of a syringe with a large needle will control post-operative pain.—V. E. Lager, *Dental Digest.*

Chronic Ulcerative Pulpitis.—In chronic ulcerative pulpitis, the *sine qua non* is the exposure of the pulp. Room for expansion and drainage of the pulp is necessary for the full development of this stage of the disease. Ordinarily the patient complains of little pain, since the primary factors for its causation—swelling and resultant pressure from being inclosed in an unyielding wall of dentin—are removed. When food particles or other substances are crowded into the cavity, a momentary paroxysm of diffuse pain may occur. Temperature changes, as a rule, do not cause appreciable reactions. The arteries and veins are permanently distended, accompanied by degenerative changes in the nerves. The pulp tissue proper usually undergoes necrobiotic changes with ulceration near the line of demarcation—phlegmonous destruction—or it may become atrophic. Sometimes one observes an increase in the connective tissue elements. Chronic pulpitis may perhaps always be regarded as the sequence of some primary acute attack; it is principally confined to bicuspids and molars. Depending on the progress of degeneration, a more or less strong electric current is necessary to establish a response from the pulp.—H. Prinz, *Dental Summary.*

A Replanted Tooth Lasting Sixteen Years.—The history of the case in question is as follows: An abscessed upper lateral which would not respond to any form of treatment, and in which a Glidden drill had been broken, was finally extracted. Previously, a splint was struck up to fit the tooth and its two neighbors. The crown, which was badly discolored, was excised and a Richmond crown fitted, the broken drill was removed and the apex filled with a Dall's porcelain inlay. The root was found to be badly exostosed; it was cleansed of all pericementum, and replanted six hours after the extraction. After six weeks it was perfectly firm and remained so for sixteen years, when it was fractured by biting on a hard piece of toast. Barring this accident, it would probably have continued to render service for many years.—C. Lotinga, *Dental Record.*

Dental Alopecia.—Owing to the common embryonal origin of the cutaneous appendages and the teeth, it does not surprise us to find them involved together in congenital malformations. The dentition may be defective in congenital absence of hair, and when the latter is very redundant, as in certain cases of familiar hypertrichosis (dog-faced men), there may be very notable dental defects suggesting compensation. Attention has often been called to the coincidence of early baldness and early caries, and some years ago an attempt was made to isolate a distinct affection of the two systems under the name of Jacquet's disease. At a discussion last June on hair anomalies before the Biological Section of the Aerztlicher Verein of Hamburg (see *Münchener Medizinische Wochenschrift,* July 28, 1914) the condition of "alopécie dentaire" was mentioned by two of the members. Plaut, as a result of his own experience, was inclined to hold the teeth responsible for the production of certain cases of alopecia areata. Very convincing was the fact that, during orthodontic treatment, baldness in spots often appeared, the hair growing in after the removal of the appliances. (See also "Baldness of Dental Origin," Dental Cosmos, September 1914, p. 1093.)—*Woman's Med. Journal.*

Improved Root-canal Work, and the Value of the X-Ray.—Among recent changes in operative dentistry, that of improved root-canal work is undoubtedly the most important. It is a truism to say that a tooth is no better than its root. Now we know that a diseased root not only means a painful and useless organ, but it is a menace to the general health of the patient of so serious a nature as to require prompt cure or removal in all cases. The "comfortable" chronic abscess of old is a potent factor in the causation of many acute systemic troubles, and in organic injuries, leading to premature senility. It must be eradicated; and as extraction means a serious loss in most cases, successful root-work becomes of commanding importance.

No operator, however skilful, can do correct work without the roentgenogram; the best of operators are being daily amazed and humiliated with this truth, in inspecting their old work by this means. Knowledge instead of surmise concerning the length and shape of roots is essential in this work, and the X-ray is the only means available.—EDITORIAL, *Journ. Allied Dental Societies.*

Care of the Electric Dental Engine.—The electric engine is often allowed to stay idle until fixed by a mechanic, when a little intelligent investigation on the operator's part could easily remedy the trouble. Every manufacturer complains that operators will not read directions and keep them for future reference, whereby a great deal of expense for repairs and adjustments could be saved. The trouble should be located by beginning at the source of the current supply and working down to the device itself. The most probable causes to be eliminated are as follows: (1) Is the main source of current supply cut off? This is tested by turning on the electric lights. (2) Is the current being supplied to the switchboard? This is tested by seeing if other apparatus supplied by the switchboard will work. (3) Does the switchboard supply current to the particular terminal attached to the troublesome apparatus? The terminal plugs are exchanged with that of a piece of apparatus that is in working order. Perhaps the switchboard fuse is blown out. (4) Does the terminal of the wire in the instrument itself supply current? A test lamp or contact with the fingers must now be used. The trouble will generally be found by this time, but if an examination of the commutator, foot controller, and cable of the engine reveals no broken or loose wires, the trouble is of such a nature that it cannot be easily remedied.—R. L. GIRARDOT, *Austral. Journ. of Dentistry.*

Streptococci in Pyorrhea Alveolaris and Apical Abscesses.—Streptococci of the viridans group are constantly present in peridental suppurative lesions. This is not surprising, since such streptococci are normally present in the saliva and on the buccal mucous membranes; we feel sure, however, that by proper technique contamination from this source can be excluded. These streptococci are normally of low virulence, but are at times able to produce lesions of the heart, aorta, kidneys, and joints, some of which closely resemble the lesions of rheumatism; that they are potentially of high virulence is shown by the experiment in which they were grown in the anterior chamber of the eye. We cannot claim, from the evidence so far obtained, that these streptococci bear an etiologic relationship to dental abscesses and pyorrhea, but from the point of view of metastatic infections, it is important to know that such organisms are constantly present in lesions presenting a large ulcerated surface, through which they may pass, and probably do frequently pass into the deeper tissues and the blood-stream.—T. B. HARTZELL and A. T. HENRICI, *Journ. Amer. Med. Association.*

Some Experiences with Alcohol Injections in Trigeminal and Other Neuralgias.—W. Harris reports his experience with alcohol injections in neuralgia. He cautions against injection directly into a mixed nerve, such as the sciatic, on account of the motor as well as sensory paralysis it will produce. Many patients who have thus been operated upon have escaped paralysis by their good luck in the operator missing the nerve trunk and injecting around its sheath. He gives a case of his own experience which is instructive as regards this point. He has had experience with some 200 cases of chronic trigeminal neuralgia. The first division is seldom involved alone, the second also usually being implicated. The supra-orbital is the only branch of the first division Harris attacks. Attempts to reach the infra-orbital branches he thinks dangerous and needless. The second division or superior maxillary nerves can be reached with advantage either at the foramen rotundum in the sphenomaxillary fossa, or at the exit of the infra-orbital nerve on the cheek. In the majority of cases the pain is referred to the upper jaw, and the nerve must be attacked at the foramen rotundum; this is difficult, while the other injection is easy. Harris uses two routes for this posterior injection; the first, and preferably, through the cheek in front of the coronoid process and behind the max-

illa. If the coronoid process of the mandible comes too far forward or the antrum bulges backward, it may be hard to direct the needle between these parts and in front of the external pterygoid plate so as to enter the spheno-maxillary fossa. In such cases he tries to reach the nerve from behind the coronoid process, passing the needle through the cheek about four centimeters in front of the middle of the internal auditory meatus on the line drawn from the incisura notch to the bottom of the ala nasi so as to pass over the bottom of the sigmoid notch on the lower jaw. With this, the needle passes slightly upward and forward and the pterygoid plate is felt for. The injection of the third division at the foramen ovale is much more certain and easy. For this he uses roughly Levy and Baudouin's line.

In over sixty cases in which he has injected the Gasserian ganglion, he has seen, in one, slight diplopia due to sixth-nerve weakness appear immediately, and last for three months. In another case there was temporary vertigo and nystagmus, for which he cannot easily account. Almost always, Harris finds loss of taste occur immediately after injections of the third division of the fifth nerve, confined to the anesthetized half of the tongue in proportion to the depth of the anesthesia. This lasts as long as the anesthesia, and he has seen it two years after injection. This occurs immediately, proving that taste fibers from the tongue pass along to the Gasserian ganglion via the third division. He has encountered two patients who suffered from paroxysmal neuralgia in which the paroxysms began in the throat or posterior palatal region on one side, and spread into the ear and in front of the ear on to the cheek and down the side of the neck. In each case no relief was given by an injection of the third division of the fifth, and Harris considers these as cases of geniculate neuralgia such as are described by Pierce, Clark, and Taylor. Post-therapeutic neuralgia should never be treated by alcoholic injection or any other operative measures, as it makes the cases worse, even if they may appear at first to be relieved. He has seen decided benefit in chronic fibrositis and brachial fibrositis from alcohol injection. Migranous neuralgia is rarely benefited, but the post-influenza of periodic supra-orbital neuralgia may be sometimes completely cured by a single injection. It is in chronic trigeminal neuralgia that most cures are obtained.—*Journ. Amer. Med. Association*, per *Amer. Journ. of Surgery.*

OBITUARY.

DR. KIRK ADDISON DAVENPORT.

[See Frontispiece.]

Died, suddenly, March 13, 1915, at his home, 63 Finchley Road, N.W., London, Eng., Kirk Addison Davenport, D.D.S., M.D.S.

Dr. Davenport was the youngest of eight children of the late Rev. Wm. W. Davenport of Union, N. Y. After being graduated from the dental school of the University of Pennsylvania, he took a postgraduate course at the Harvard University dental school, also passed the New York State Board of Dentistry. He spent two years in association with Dr. N. S. Jenkins of Dresden, Germany, after which he established himself at 20 Stratford Place, W., London, Eng., where for twenty years he enjoyed one of the most lucrative practices in Europe.

He was a past president of the American Dental Society of Europe, and of several other well-known American societies; also a prominent member of many dental societies in England.

He was a brother of the well-known dentists, Dr. Isaac B. Davenport and Dr. Wm. Slocum Davenport of Paris, France.

Deceased was married on August 15, 1900, to Lou Mersereau, a native of his home town; who, together with two children—a son, Kenneth, and a daughter, Dorothy Lou—survives him.

Dental Legislation.

Recent Dental Legislation in the Philippines.

Regulating the Examination of Dentists and the Practice of Dentistry.

AN ACT

Providing New Regulations for the Examination of Dentists and the Practice of Dentistry in the Philippine Islands, and for Other Purposes.

By authority of the United States, be it enacted by the Philippine Legislature, that—

Section 1. *Board of Dental Examiners; appointment of members; removal and appointment of their successors.* The Director of Health, with the approval of the Secretary of the Interior of the Philippine Islands, shall appoint a Board of Dental Examiners consisting of three reputable dentists, legally practicing their profession in the Philippine Islands at the time of their appointment, who are graduates of any reputable dental college or institution legally constituted and recognized as such by the Insular Government. They shall hold office for three years after their appointment, and until their successors are appointed and qualified: *provided*, That of the first appointments made, one shall expire on the thirty-first of December, nineteen hundred and fifteen; another on the thirty-first of December, nineteen hundred and sixteen; and the third on the thirty-first of December, nineteen hundred and seventeen, as certified in their respective certificates of appointment. Each person appointed to the board shall qualify by taking and subscribing to the following oath of office:

"I, ——, having been appointed a member of the Board of Dental Examiners for the Philippine Islands, do hereby solemnly swear that I have the qualifications required by law; that I will well and truly perform the duties of said office; that I will give an exact and full account of all moneys coming into my hands as such officer; that I will bear true faith and allegiance to the Government of the United States and to the Government of the Philippine Islands; and that I take this oath without any mental reservation whatsoever. So help me God."

The oath shall be filed and recorded in the office of the Director of Health.

The Director of Health, with the approval of the Secretary of the Interior, shall fill any vacancy that may occur in the board within one month after the vacancy occurs, and the person so appointed to fill a vacancy shall hold office only for the unexpired term of the member whose place he is appointed to fill. The Director of Health, with the approval of the Secretary of the Interior, may remove any member of said board for neglect of duty, or incompetency, or for unprofessional or dishonorable conduct, or for any other just cause.

Sec. 2. *Board of Dental Examiners; organization and duties; compensation, annual election; records.* The Board of Dental Examiners shall appertain to the Bureau of Health. It shall organize immediately after the appointment of its members by electing from its members a president and a secretary-treasurer thereof; it shall hold an annual election on each second Tuesday of January; and it shall keep a seal with which to attest its official acts. The secretary-treasurer shall receive as compensation the amount of three hundred pesos per annum, and the other members of the board shall receive as compensation the sum of five pesos for each candidate examined for registration as a dentist. The compensation of the secretary-treasurer shall be paid one-half on the thirtieth of June and the other half on the thirty-first of December of each year.

All receipts of the board from whatever source shall be covered into the Insular treasury, and all expenditures of the board, including compensation of the members thereof, shall be paid out of the funds appropriated for the Bureau of Health, and the

sum of one thousand pesos is hereby appropriated for such purpose for the fiscal year nineteen hundred and fifteen out of any funds in the Insular treasury not otherwise appropriated. The secretary-treasurer shall execute a bond for five hundred pesos, with good and sufficient sureties, which shall be approved by the Insular Treasurer, conditioned upon the payment of all moneys which he may receive as secretary-treasurer and upon the faithful performance of the duties of his office. He shall keep a record of the proceedings of the board, and a register of all persons to whom certificates of registration have been granted, setting forth the name, age, place where established, post-office address, the name of the dental institution from which he graduated or in which he has studied, the date of such graduation or upon which he finished his studies, together with the time spent by him in the study of dentistry, and the names and locations of all other institutions which have granted to him degrees or certificates of attendance, clinics, or lectures in medicine or dentistry.

SEC. 3. *Board of Dental Examiners; meetings; examinations.* The Board of Dental Examiners shall meet in the city of Manila for the purpose of examining candidates desiring to practice dentistry in the Philippine Islands on the second Tuesday of June and December of each year, and shall issue a certificate of registration as dentist to each candidate who furnishes satisfactory proof of having received a diploma as either doctor of dental medicine or doctor of dental surgery as required by Section 6 of this act, of being of good moral conduct, and who in addition passes a satisfactory examination before the board in all of the subjects of dental surgery and other auxiliary subjects, in accordance with the teaching plan of the principal and best dental institutions having the best reputation for the excellence of their teaching.

SEC. 4. *Certificate fees.* The secretary-treasurer of the Board of Dental Examiners shall charge the following fees:

For admission to examination, twenty pesos;

For each new certificate of registration as dentist, or temporary certificate, thirty pesos; and

For each renewal of a certificate of registration as provided for in Section 7 of this act, two pesos.

SEC. 5. *Rules and reports of the Board of Dental Examiners; requirements as to dental colleges or schools.* The Board of Dental Examiners shall, on the thirty-first of December of each year, make a detailed report to the Director of Health of all of its work during the year, and of all moneys received and disbursed by it during that period.

With the approval of the Director of Health, the board may approve such rules and regulations not in conflict with the provisions of this act as may be necessary to carry said provisions into effect. Private dental schools or colleges or the departments of dental surgery of the universities shall be subject to the rules and regulations to be prescribed by the board, with the approval of the Director of Health and the Secretary of the Interior, for the purpose of establishing therein a uniform plan of teaching.

SEC. 6. *Qualifications of candidates to be admitted to examination.* Hereafter the Board of Dental Examiners shall admit to examination for the practice of dentistry in the Philippine Islands only those persons who have a diploma of doctor of dental medicine or of doctor of dental surgery from an institution duly accredited and legally constituted: *provided, however,* That all students who at present are *bona fide* taking a course in dentistry in the University of Santo Tomas, Manila, and who will graduate as surgeon dentists from said institution in the academic courses terminating in March, nineteen hundred and fifteen, and in March, nineteen hundred and sixteen, shall be exempt from this requirement and may be admitted to examination provided they have the title of dental surgeon from said university and have all the other qualifications hereinunder prescribed.

SEC. 7. *Who may legally practice dentistry in the Philippine Islands; certificate of registration from the Board of Dental Examiners.* Any person who, upon the passage of this act, is registered in the official register of the Board of Dental Examiners, created by Act numbered Five hundred and ninety-three, as a fully qualified dentist, or who, if an undergraduate dentist, has practiced as such for not less than three years, may hereafter practice dental surgery anywhere in the Philippine Islands, provided such person presents his old certificate to the Board of Dental Examiners established by this act within six months after the organization thereof and secures a certificate of registration in accordance with this act, it being the duty of said board to issue a new certificate to any person presenting his old certificate: *provided, however,* That any undergraduate dentist hereafter completing three years of practice as such may likewise practice dentistry anywhere in the Philippine Islands after obtain-

ing his certificate of registration: *provided further*, That any undergraduate dentist having practiced dentistry for less than three years may freely practice at the place where he is established, although a fully qualified dentist may establish himself at the same or at any other place where a fully qualified dentist is not established: *and provided, finally*, That any undergraduate dentist having practiced as such for less than three years may register under this act and practice anywhere in the Islands, provided he has passed a postgraduate course in any duly established dental college, and in such case such undergraduate may practice as such while taking such course at the place where the college in which he is studying is located.

SEC. 8. *Practice of dentistry.* Any person shall be regarded as practicing dentistry within the meaning of this act who shall for a fee, salary, of other reward, paid to himself or to another person, perform any operation or part of an operation upon the human teeth or jaws, or who shall treat diseases or lesions or correct malpositions of the teeth; but this provision shall not apply to artizans engaged in the mechanical construction of artificial dentures or other oral devices, or to students of dentistry practicing in any legally chartered college or establishment on patients under the direction of a professor in such college or of a dental surgeon of such establishment: *provided, however*, That nothing contained in this section shall apply to the dental surgeons of the United States army or navy in these Islands while on duty as such for the members of said army or navy: *provided further*, That this provision shall not be construed to interfere with physicians and surgeons in their legitimate practice as defined by Act numbered Three hundred and ten.

SEC. 9. *Temporary certificates of registration.* Any two members of the board may issue a temporary certificate of registration to practice dentistry to the applicant upon presentation by such applicant of satisfactory evidence that he possesses the qualifications prescribed by this act to practice dentistry. Such certificate shall be valid only until the next regular meeting of the board, at which time the person to whom it has been issued shall report for examination. Temporary certificates of registration shall be issued only when the board is not in session and will not meet within thirty days. In no case shall a temporary certificate of registration be renewed or extended, nor shall a second temporary certificate of registration be granted to any person. The applicant shall also file in said office an affidavit to the effect that it is his intention to appear at the next regular meeting of the board and to submit to an examination with a view to obtaining a permanent certificate. Should he appear and pass a satisfactory examination, a permanent certificate shall be granted to him without additional charge; but should he fail to appear or pass a satisfactory examination, the money deposited by him shall not be returned to him.

SEC. 10. *Reasons for not granting and for revoking certificates of registration.* The Board of Dental Examiners shall refuse to issue the certificates provided for by this act to any person convicted by a court of competent jurisdiction of any criminal offense involving moral turpitude, to any person guilty of immoral or dishonorable conduct, or of unsound mind, and in the event of such refusal shall give to the applicant a written statement setting forth the reason for its action, which statement shall be incorporated in the record of the board. The board may also revoke a certificate for like cause, or for unprofessional conduct, malpractice, incompetency, or serious ignorance or malicious negligence in the practice of dentistry, wilful destruction or mutilation of a natural tooth of a person with the deliberate purpose of substituting the same by an unnecessary or unessential artificial tooth; for making use of fraud, deceit, or false statements to obtain a certificate of registration; habitual use of intoxicating liquors or medicines causing him to become incompetent to practice dentistry; the employment of persons who are not duly authorized to do the work that under this act can be done only by persons who have certificates of registration to practice dentistry in the Philippine Islands; the employment of deceit or any other fraud with the public in general or some client in particular, for the end or purpose of extending his *clientèle;* making false advertisements, publishing or circulating fraudulent or deceitful allegations regarding his professional attainments, skill, or knowledge, or the methods of treatment employed by him. The revocation of a certificate of registration made by the board, after having duly notified and heard the party concerned, shall be subject to appeal before the Director of Health, whose decision shall be final in all cases.

SEC. 11. *Display of name and certificate of registration.* Every practitioner of dentistry shall display in a conspicuous place upon the house or office where he practices his name and surname, and he shall further display his certificate of registration in his office in

plain sight of patients occupying his dental chair. Any owner or proprietor of a dental office or establishment is also under obligation of displaying in conspicuous places upon the office or establishment the names and surnames of each and every one of the persons practicing dentistry in said office or establishment and of displaying the certificates of registration of each and every one of such persons in the same manner as hereinbefore provided.

SEC. 12. *Illegal use of diplomas or titles.* No person shall in any way advertise as a bachelor of dental surgery, doctor of dental surgery, master of dental surgery, licentiate of dental surgery, doctor of dental medicine, or dental surgeon, or append the letters B.D.S., D.D.S., M.D.S., L.D.S., or D.M.D. to his name, who has not, duly conferred upon him by diploma from some school, college, university, or board of examiners qualified to confer the same, the right to assume said title, nor shall any person assume any title or prefix or append any letters to his name to represent falsely that he has received a dental degree or certificate of registration.

SEC. 13. *Penalties.* Any person violating any section, clause, paragraph, or any provision of this act shall be criminally prosecuted before a court of competent jurisdiction, and upon conviction shall be punished for each violation with a fine of not more than one thousand pesos, or by imprisonment for not more than one year, or by both such fine and imprisonment, in the discretion of the court.

SEC. 14. *Repeal of other laws.* All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

SEC. 15. This act shall take effect on its passage.

Enacted February 5, 1915.

Creating a Board of Dental Hygiene for the Maintenance of Free Dental Clinics for School Children, etc.

AN ACT

TO CREATE A BOARD OF DENTAL HYGIENE FOR THE PURPOSE OF ESTABLISHING AND MAINTAINING FREE DENTAL CLINICS FOR CHILDREN MATRICULATED IN PUBLIC AND PRIVATE SCHOOLS OF PRIMARY INSTRUCTION IN THE PHILIPPINE ISLANDS, AND FOR OTHER PURPOSES.

By authority of the United States, be it enacted by the Philippine Legislature, that—

SECTION 1. *Board of Dental Hygiene; appointment; duties; meetings.* The Secretary of the Interior shall appoint three lawfully qualified practicing dentists, residents of the Philippine Islands, to form the Board of Dental Hygiene. The members of this board shall hold office until their successors shall have been appointed and qualified. They shall serve without any compensation whatsoever. Immediately after their appointment they shall meet and elect from among their number a chairman and a secretary. They shall meet from time to time, as the needs of their duties may require. On or before January first, nineteen hundred and sixteen, they shall present to the Director of Health a report of the work performed since their appointment, setting forth the number of children whose teeth have been attended to, the nature of the dental work done for them, and any other information they may deem of interest, and stating all sums of money received and the origin thereof, and all disbursements, and the purposes thereof. They shall under no circumstances contract obligations in a sum in excess of the actual amount of cash on deposit in the Insular treasury to the credit of the board. They shall perform all such other duties as may be necessary to carry out the purposes of this act.

SEC. 2. *Funds, how provided.* The Board of Dental Hygiene is authorized to solicit and accept money for the purposes and use of the dental clinics in the public schools of the Philippine Islands, during the period from its organization to December first, nineteen hundred and fifteen.

SEC. 3. *Funds, how deposited.* All sums received for the purposes of the present act shall be forthwith deposited in the Insular treasury to the credit of a fund to be designated as "dental hygiene fund." It shall be the duty of the members of the board, or their agents, to issue to each contributor or subscriber to the fund a receipt countersigned by the Insular Treasurer, for the exact sum paid by him and deposited in the Insular treasury.

SEC. 4. *Expenditure of the money.* The money so received, or so much thereof as may be necessary, shall be disbursed for no other purpose except that of furnishing free dental service to the poor children in the public schools of the Philippine Islands, when deemed in the best interest of the pupils attending the schools, and to any and all children attending public and private schools of primary instruction. The expenditures shall be limited to the following items:

(*a*) Purchase of dental instruments and equipment necessary for properly carrying out the dental work contemplated by this act.

(*b*) Essential expenditures in connection with the raising of funds, and the establishment of dental clinics, and the necessary expenses in connection with the business of the board.

(*c*) For material, medicines, and dental supplies to be used for dental work on the school children.

(*d*) For the compensation of such assistants, and others doing real dental work for the school children.

(*e*) For the compensation of such assistance or service as may be essential for carrying out the dental work in an adequate and sanitary manner.

SEC. 5. *Employees.* All dentists, assistants, and other employees paid out of the dental hygiene fund shall be natives of the Philippine Islands or of the United States. They shall be selected impartially and in accordance with their aptitude for performing the service required.

SEC. 6. *Disbursements upon vouchers.* The Insular Treasurer shall not under any circumstances pay any money out of the dental hygiene fund created by this act, except upon the presentation of vouchers duly signed by all three members of said board and countersigned by the Director of Health and the Director of Education, and in case of the absence of one or both of them, or of any other good reason for inability to secure their approval, by their representatives in their respective bureaus.

SEC. 7. This act shall take effect on its passage.

Enacted February 5, 1915.

LOUIS OTTOFY,
Secretary of the Board.

DENTAL COLLEGE COMMENCEMENTS.

VANDERBILT UNIVERSITY, DEPARTMENT OF DENTISTRY.

THE annual commencement exercises of Vanderbilt University, Department of Dentistry, were held in Nashville, Tenn., on May 29, 1915.

An address to the graduates was made by Rev. W. W. Alexander.

The degree of Doctor of Dental Surgery was conferred by Chancellor James H. Kirkland, A.M., Ph.D., LL.D., on the following graduates:

George W. Bacon	Texas
Daniel M. Boles	Texas
Robert D. Boyles	Tennessee
Louis D. Butler	Mississippi
Thomas A. Chichester, Jr.	Mississippi
William B. Clotworthy	Tennessee
Troy Coffman	Arkansas
James T. Conner	Tennessee
John O. Cummins	Tennessee
Joe L. Curry	Texas
Tasso M. Edwards	Arkansas
Herschell A. Graves	Tennessee
Gladys Griffis	Texas
Frank F. Happy	Ohio
Richard L. House	Alabama
William T. Hutchison, Jr.	Tennessee
Frank C. Johnson	Arkansas
Aloysius F. Kasper	Indiana
Frank D. Knox	Tennessee
Herman J. Lambert	Georgia
Thomas L. McMurphy	Alabama
William W. Martin	Tennessee
John A. Moore	Tennessee
Charles F. Pickering	Tennessee
Joseph E. Richardson	Louisana
Everette G. Salmons	North Carolina
James H. Shaw	Alabama

UNIVERSITY OF CALIFORNIA, COLLEGE OF DENTISTRY.

THE fifty-second annual commencement exercises of the University of California, College of Dentistry, were held in the Greek Theater, Berkeley, Cal., May 12, 1915.

The degree of Doctor of Dental Surgery was conferred by the president of the university on the following graduates:

Frank C. Bettencourt
Francis Bisson, Jr.
Leslie R. Codoni
Charles W. Cooper
Keith Hamner
Albert E. Hancock
Frank H. Ito
Edward W. Kimball
James C. Lough
Harry J. Mathieu
Takeo Namura
Benjamin G. Neff
Mervyn C. Rudee
Walter C. Schramm
Alfred J. Smith
Walter S. Smith
Horace I. Spare
Gerald F. Stoodley
Hall Weston

CHICAGO COLLEGE OF DENTAL SURGERY (DENTAL DEPARTMENT VALPARAISO UNIVERSITY).

THE thirty-third annual commencement exercises of the Chicago College of Dental Surgery were held in the Garrick Theatre, Chicago, Ill., on June 1, 1915.

Addresses were delivered by Rev. Wm. C. Covert, D.D., and Prof. Calvin S. Case.

The degree of Doctor of Dental Surgery was conferred by the dean, Truman W. Brophy, M.D., D.D.S., LL.D., on the following graduates:

Byron R. Bennett
Harry M. Beistle
Martin Block
James C. Brewner
Othmar P. Brick
Hyman Burton
James C. Campbell
Edmund H. Carroll
Herbert E. Carson
Maurice L. Chetlain
Walter P. Christiansen
Edward L. Clark
Ray C. Comstock
Glen G. Conner
Robert J. Cox
William T. Cramer
Joseph L. Cummings
Edward W. Dahlberg
Leo V. Daniels
Vernon W. Davis
Frank J. Dedic
William L. Douglass
George S. Douglas
Janette (Klebansky) Fabbri
Emery Fekete
William H. Fernholz
Elias A. Frankel
Horald Briggs Foutz
Guillermo Y. Gallegos
George W. Gilbert
Walter J. Gonwa
Bernard A. Good
George A. Grant
Francois J. P. de Grasse
Emory A. Greer
Jesse C. Gue
Albert W. Guse
Earl T. Gustaveson
Anthony P. Gurskis
George N. Haik
John A. Hagan
Gail Martin Hambleton
Charles H. Hatch
Edgar W. Heerwald
Alfred R. Higson, Jr.
Homer A. Hindman
Lawrence A. Hix
Henry Horwitz
Burleigh H. Hudson
Isadore G. Hochman
Lee Jacobi
Laverne H. Jacob
Francois J. Joubert
James R. Keane
George D. Keaton
John F. Kirtz
John A. Kirchen
Albert F. Koch
Lewis S. Koffman
Sorabji M. Khambatta
Joseph G. Kohl
Herman M. Kreeger
Franciszek S. Kubiak
Morris Landesman
Frances Lasch
Stephen S. Lepak
Richard N. Lindbeck
Andrew J. Marcinkiewicz
Herbert A. Marquardt
Lynn C. Martin
Daniel H. McCauley, Jr.
William J. McCoshen
Archibald E. McCulloch
Arthur J. McDonald
John H. McDonald
Charles H. McKenzie
James E. McKenzie
Juan B. Medina
Marvin F. Miller
Toshiye Miyasaki
Augustus H. Mueller
Benjamin J. Neiman
Geoffrey H. Nelson
John P. O'Connell
Carl Oscar Olson
Paul G. Papsdorf
Homer Peer
Albert W. Peterson
Scott Turner Petrie
Gus Petty
Harry E. Pierce
Eugene W. Poulson
Christo W. Ratcheff
George W. Reimche
Willis Y. Ritenour
Charles J. Robertson
Thomas P. Rose
Alexander S. Ruden
Joseph W. Sanborn
Bores Sanderow
Stasys Sapranas
George Schvetz
Norman R. Smeltzer
John C. Shotton
Louis Sibal
Rantz E. Snoberger
Milford S. Sorley
John A. Spickerman
Raymond E. Squires
Andrew H. Stith
Leon G. Stuck
Mark E. Struble
Patrick J. Sweeney
Gustave J. Tilitsky
Joseph G. Toolson
Oscar V. Vermilye
Ralph W. Vornholt
Rutger Van Huyssteen
Philip Warsaw
Adolph Weiss
Lawrence W. Welp
Thomas H. Wilkens, Jr.
Pieter G. Wium
William W. Wumkes
Erle Yackee
Jacob Zun

NEW YORK COLLEGE OF DENTISTRY.

The forty-ninth annual commencement exercises of the New York College of Dentistry were held in Carnegie Hall, New York, N. Y., on June 7, 1915.

An address to the graduates was delivered by Hon. Job E. Hedges.

The degree of Doctor of Dental Surgery was conferred by Rev. Geo. Alexander on the following graduates:

Michael R. Adler	New York
Abraham Alexander	New York
Emil Alter	New York
Edward Amsterdam	New York
Carl Appelbaum	New York
Bar. Baksht	New York
Samuel Barr	New York
Max Benjamin	New York
Arthur L. Bergida	New York
Charles D. Bergman	New York
C. H. Spurgeon Bewkes	New Jersey
Edward Blatt	New York
*Samuel O. Braverman	New York
Wiltshire C. Clayton	New York
Sholom A. Cogan	New York
David H. Cohen	New York
Joseph B. Cohen	New York
Perry L. Diamond	New York
Ralph R. Dickson	New Jersey
Richard H. Ecker	New York
Maxwell E. Eichhorn	New York
Isidor W. Ellman	New York
Nat. Ettinger	New York
Paul Feinsod	New York
Samuel R. Feldman	New York
Jacob A. Flanzik	New York
*Benjamin Flaum	New York
Abram Friedland	New York
Morris Friedman	New York
Moses Gang	New York
Abraham Ganz	New York
Isidor Girsdansky	New York
David Gold	New York
Wm. C. Golden	New York
Abraham W. Golding	New York
Louis Goldstein	New York
Frank W. Goss	New York
Nathan Gottsegen	New York
Castor W. Gray, Jr.	New Jersey
Philip Greenberg	New York
*Abraham S. Greenstone	New York
Philip Greenwald	New York
Clinton McK. Greenwood	New York
Matthew M. A. Gross	New York
Jacob Grossman	New York
Meyer Guterman	New York
Bruno Guttchen	New York
William Haas	New York
*Joseph Haller	New York
Barnett Halpern	New York
Canute H. Hansen	New York
Samuel D. Hartstein	New York
*William Hemley	New York
Joseph I. Hermann	New York
Abraham Herz	New York
Samuel Hoch	New York
Samuel J. Hollander	New York
George G. Holz	New York
Victor Hyams	New York
Isaac Kaplan	New York
Philip Kitt	New York
Meyer Klatsky	New York
Herman E. Kowalsky	New York
Abraham I. Kringstein	New York
Louis Kronman	New York
*Isidor Landau	New York
*Niles H. Larson	New York
Charles Lax	New York
Morris F. Lear	New York
George J. Lerner	New York
Harry B. Levitt	New York
*Sidney B. Levy	New York
Jacob Lieberman	New York
Arthur W. Longworth	New York
Morton Maier	New York
Emil Mandel	New York
Robert Marks	New York
Simon Marshall	New York
Fred K. Mase	New Jersey
Harold H. Melnick	New York
Herman Mendelson	New York
Jacob Meyerson	New York
Mervin Meyrowitz	New York
Joseph S. Michtom	New York
Joseph J. Millard	Connecticut
Elias Morris	New York
John G. Myers, Jr.	New York
Hyman Nadler	New York
Abraham Nashinoff	New York
Harry Nelkin	New York
Benjamin Nussbaum	New York
Lambert R. Oeder	New Jersey
Laurence H. Overton	New York
Thomas H. Pearson	New York
Leon Albert Peron	New York
*Ernest F. Pundt	New York
Joseph W. Rauscher	New York
Gershon Redalieu	New York
Jacob Reissman	New York
Morris J. Rogow	New York
Samuel L. Rosenfeld	New York
William B. Rosenman	New York
George G. Rosenzweig	New York
Jay Rosten	New York
Harry H. Rothblatt	New York
Samuel Rothman	New York
Saul Schaenen	New York
Sidney Schattman	New York
Benjamin Schein	New York
Max Schein	New York

* Curriculum requirements completed, but degree withheld until legal requirements are fulfilled, when the degree will be conferred at the following meeting of the Board of Trustees and Directors.

Charles R. Schramm	New Jersey
Eric W. Schumacher	New York
Frederick Schwartz	New York
Louis Shiffman	New York
Solomon Simon	New York
Max Slaff	New Jersey
David Slutskin	New York
George J. Sommerfeld	New York
Alfred R. Starr, Jr.	New York
Matthew Statsinger	New York
*Barnard Steinthal	New York
Benjamin B. Sternberg	New York
*Louis Sukenick	New York
Henry Swartz	New York
David Tauster	New York
Isidore Teich	New York
Charles Teschberg	New York
*Louis Topper	New York
*Thomas J. Traynor	New York
Louis A. Ungar	New York
Max Voletsky	New York
*Hugo M. Vollmeke	New York
Julius Walder	New York
John B. Watson	New York
Herman Weinstein	New York
Hyman Wenig	New York
Joseph A. White	New York
Julius Wisoff	New York
Louis T. Wolfe	New York
Max Zauderer	New York
James L. Zemsky	New York

* Curriculum requirements completed, but degree withheld until legal requirements are fulfilled, when the degree will be conferred at the following meeting of the Board of Trustees and Directors.

KANSAS CITY DENTAL COLLEGE.

The thirty-fourth annual commencement exercises of Kansas City Dental College were held in Kansas City, Mo., on May 22, 1915.

An address was delivered by Rev. Frank S. Arnold.

The degree of Doctor of Dental Surgery was conferred by Dr. John D. Patterson on the following graduates:

Ward A. Adams	Paul A. F. Fricke	Roy E. LoVellette	Mark H. Perrin
Charles W. Aikins	Eustace C. Gilpin	Joseph L. McDonald	Ira O. Prindle
Alfred Anderson	Clark B. Hannah	Matthew McKelvey	Bernard Ragland
Orville Anderson	Leslie V. Hastings	Howard A. McKeown	Mark E. Roby
Roy H. Baker	Lewis E. Hay	Charles Mackey	Earl Scott
Arthur J. Buff	Thomas W. Haynes	Emmet E. Marr	Frederick L. Siegel
Ernest W. Browning	Foster M. Heaton	Richard R. May	Heyl B. Smith
Alex L. Collins	Thomas M. Heffron	Frank W. Mead	Thomas M. Steward
Galen J. Crook	Victor V. Hinkle	Arden T. Miller	Richard F. Thompson
Charles A. DeWolf	Warren H. Kerby	Clement G. Miller	Loos E. Wiley
Nolan W. Dorrance	William J. Koehler	Lawrence E. Montgomery	Glenn A. Willgus
Walter E. Ferguson	David A. Lacquement	Ernest G. Netherton	Carlton M. Williams
Frederick P. Fishburne	Frederick A. Lenhart		

Society Notes and Announcements.

PANAMA-PACIFIC DENTAL CONGRESS.—The early date at which we go to press precludes the insertion in this issue of a mass of information just received from the Committee of Organization of the Congress, who are able to assure the profession that the prospects are excellent for a large and successful meeting. Our August issue will devote several pages to giving the fullest information concerning this great gathering, including travel rates and time tables.—ED.

DENTAL SOCIETY MEETINGS: July, August, and September.

JULY.

New Jersey State Dental Society. Asbury Park. Four days: July 21st to 24th.

AUGUST.

American Society of Orthodontists. San Francisco. August 30th.

International Dental Congress and National Dental Association. San Francisco, Cal. August 30th to September 9th.

SEPTEMBER.

Delta Sigma Delta Fraternity. San Francisco, Cal. September 1st.

International Dental Federation. San Francisco, Cal. September 2d and 3d.

Examiners' Meetings.

Idaho Board of Examiners. Boise. July 6th.

Maine Board of Examiners. Augusta. July 1st to 3d.

Montana Board of Examiners. Helena. July 12th to 15th.

North Dakota Board of Examiners. Fargo. July 13th.

South Dakota Board of Examiners. Sioux Falls. July 13th to 16th.

DELTA SIGMA DELTA FRATERNITY.

The thirty-first annual meeting of the Supreme Chapter of Delta Sigma Delta Fraternity will be held in the Auditorium Building, San Francisco, Cal., Wednesday, September 1, 1915, at 10 A.M. At this meeting the regular order of business will be carried out, to be followed by initiatory exercises in the afternoon. The annual banquet will be held at the St. Francis Hotel, at 7 P.M. The headquarters of the Fraternity will be at the Clift Hotel.

By order of the Supreme Chapter.

Burton L. Thorpe, *Supreme Grand Master*,
R. Hamill D. Swing, *Supreme Scribe*.

"F. D. I."

INTERNATIONAL DENTAL FEDERATION.

Meeting at San Francisco, September 2 and 3, 1915.

The next meeting of the International Dental Federation will be held September 2 and 3, 1915, at San Francisco, Cal. Headquarters will be at the Clift Hotel.

Truman W. Brophy, *President*,
Burton Lee Thorpe, *Asst. Sec'y*,
3605 Lindell Blvd., St. Louis, Mo.

AMERICAN SOCIETY OF ORTHODONTISTS.

There will be a meeting of the American Society of Orthodontists held on Monday, August 30, 1915, at 9.30 A.M., at San Francisco, Cal., in the room assigned to the Orthodontia Section of the Panama-Pacific Dental Congress. It is respectfully requested that as many members of the American Society of Orthodontists as possible be present.

F. C. Kemple, *President*,
F. M. Casto, *Sec'y-Treas.*

UTAH STATE DENTAL SOCIETY.

WANT TO ENTERTAIN VISITING DENTISTS.

THE Utah State Dental Society desire to entertain all dentists who visit Salt Lake City or Ogden. This we shall be very glad to do, if we are notified when they, individually or collectively, will arrive in either of these towns.

EARL G. VAN LAW,
Chairman Entertainment Committee.
913 Walker Bk. Bldg., Salt Lake City, Utah.

DEWEY SCHOOL OF ORTHODONTIA.

ALUMNI ASSOCIATION.

THERE will be a meeting of the Alumni of the Dewey School of Orthodontia, at the Baltimore Hotel, Kansas City, August 18, 19, and 20, 1915.

A. C. GIFFORD, *Sec'y.*

NORTHEASTERN DENTAL ASSOCIATION.

THE Northeastern Dental Association will hold their twenty-first annual meeting in Springfield, Mass., on October 13, 14, and 15, 1915.

ALVIN A. HUNT, *Sec'y,*
Hartford, Conn.

NEW JERSEY STATE DENTAL SOCIETY.

THE forty-fifth annual convention of the New Jersey State Dental Society will be held at Asbury Park on July 21, 22, 23, and 24, 1915.

The headquarters will be located at the Coleman House. The ballroom will be used for all meetings of the society. The glass-inclosed Casino over the ocean, just across the ocean drive from the Coleman House, has been secured for the exhibits and clinics. With over 2000 more square feet of floor-space than the pavilion used last year there should be adequate room.

Dr. Chauncey F. Egel of Westfield, N. J., is chairman of the Exhibit Committee, and reports that applications are already being made for space. Dr. W. W. Hodges of Perth Amboy is arranging for an attractive list of clinics. The Essay Committee, under the chairmanship of Dr. James I. Woolverton of Trenton, will have three essayists of prominence to present.

A cordial invitation to attend is extended to all ethical practitioners.

JOHN C. FORSYTH, *Sec'y,*
430 E. State st., Trenton, N. J.

MAINE BOARD OF EXAMINERS.

THE Maine Board of Dental Examiners will meet in the State-house, Augusta, Me., July 1, 2, and 3, 1915.

I. E. PENDLETON, *Sec'y,*
Lewiston, Me.

MONTANA BOARD OF EXAMINERS.

THE Montana State Board of Dental Examiners will hold a session for examination at Helena, Mont., on July 12, 13, 14, and 15. 1915.

G. A. CHEVIGNY, *Sec'y,*
_____ Butte, Mont.

IDAHO BOARD OF EXAMINERS.

THE next meeting of the Idaho State Board of Dental Examiners will be held in Boise, beginning Tuesday, July 6, 1915, at 9 A.M., at the State Capitol.

For applications and other information address

ALBERT A. JESSUP, *Sec'y,*
Box 1414, Boise, Idaho.

SOUTH DAKOTA BOARD OF EXAMINERS.

THE South Dakota State Board of Dental Examiners will hold its next meeting at Sioux Falls, S. D., July 13, 1915, at 9 A.M. sharp, continuing three days. All applications must be in the hands of the secretary by July 1st. Fee $25. Address

ARIS L. REVELL, *Sec'y,*
_____ Lead, S. D.

NORTH DAKOTA BOARD OF EXAMINERS.

THE next regular meeting of the North Dakota State Board of Dental Examiners will be held in the Armory at Fargo, N. D., beginning July 13, 1915. All applications must be in the hands of the secretary by July 3, 1915.

For further particulars write

F. A. BRICKER, *Sec'y,*
Fargo, N. D.

EXAMINATION OF DENTISTS FOR THE U. S. ARMY.

The Surgeon-general of the army announces that examinations for the appointment of acting dental surgeons will be held at Fort Slocum, N. Y.; Columbus Barracks, Ohio; Jefferson Barracks, Mo.; Fort Logan, Colo.; and Fort McDowell, Cal., on Monday, October 18, 1915.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S. Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and twenty-seven years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Acting dental surgeons are employed under a three years' contract, at the rate of $150 per month. They are entitled to traveling allowances in obeying their first orders, in changing stations, and in returning to their homes at termination of service. They also have the privilege of purchasing certain supplies at the army commissary. After three years' service, if found qualified, they are promoted to the grade of dental surgeon, with the rank of first lieutenant, and receive thereafter the pay and allowances appertaining to that rank.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination. Early attention is therefore enjoined upon all intending applicants. There will be twelve vacancies to be filled.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING MAY 1915.

May 4.

No. 1,137,916, to Joseph Simmons. Tooth-brush.

No. 1,138,355, to Cassius M. Carr. Dental tool.

No. 1,138,477, to Joseph R. Hibbets. Barber's chair.

No. 1,138,479, to Willis L. Hough. Dental polishing device.

No. 1,138,523, to Robert Morse Withycombe. Antiseptic tooth-brush receptacle.

No. 1,138,568, to Edgar G. Hubbel. Tooth-brush.

May 11.

No. 1,138,631, to Harry M. Crawford. Dental instrument.

No. 1,139,017, to Edwin H. Crawford. Instrument for re-cementing dental bridges and the like.

No. 1,139,028, to Albert E. Gibson. Artificial tooth.

No. 1,139,170, to Frederick W. Drissler. Tooth-regulating appliance.

No. 1,139,265, to Joseph Archibald Gardner. Artificial tooth.

May 18.

No. 1,139,581, to Thomas L. Riley. Dental tray.

No. 1,139,615, to James Leon Williams. Artificial tooth.

May 25.

No. 1,140,363, to Arthur L. Dearth. Impression holder for dental work.

No. 1,140,537, to Frank H. Skinner. Dental bridge and crown.

No. 1,140,539, to Frank H. Skinner. Removable dental bridge attachment.

No. 1,140,566, to Henry P. Boos. Dental plate-holder.

No. 1,140,690, to Harry Lipari. Tooth-brush.

No. 1,140,759, to Christoph F. Montag. Orthodontia appliance.

No. 1,140,936, to Andrew J. Asch. Backing for artificial teeth.

THE

DENTAL COSMOS.

VOL. LVII. AUGUST 1915. No. 8.

ORIGINAL COMMUNICATIONS.

THE NOSE, THROAT, AND EAR AS NEIGHBORING ORGANS TO THE TEETH.

By WILLIAM REDFIELD BUTT, M.D., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, April 27, 1915, and the North Philadelphia Association of Dental Surgeons, May 12, 1915.)

BELIEVING that an exchange of ideas in neighboring specialties is helpful, I shall attempt a few remarks from the viewpoint of a throat, nose, and ear specialist, and exhibit some specimens used in teaching operative rhinology at the Philadelphia Polyclinic postgraduate school.

REFERRED PAIN.

Dentists as well as rhinologists have occasion to remember the distribution of the trifacial nerve over the face and including the ear, nose, and throat as well as the teeth, and the many cases of referred pain which arise from this distribution. Thus I have been consulted for earache in cases where the ear was entirely normal, and in which the pain felt exclusively in the ear arose entirely from irritation of the fifth nerve produced by a decayed tooth, the sole treatment consisting in having a dentist clean and fill the tooth, with immediate disappearance of the earache.

I have also seen exactly the reverse of this in a case of acute inflammation of the ear—in which case the pain for two days was localized around several crowned molar teeth, and the ear was not suspected even by the patient herself until later events proved that all the pain referred to the teeth had arisen from the ear, which examination showed to be inflamed and which afterward suppurated.

This inability of patients at times to distinguish between pain arising from the ear and from the teeth and mouth is most remarkable. I have seen many patients complaining of sore throat or earache in which the painful sensations were found to arise from unerupted third molars, ulceration of the gums, or decayed teeth. One case of infection around an impacted third molar had ear pain for a long time, which would appear and disappear according to the condition around this tooth, while the ear itself was absolutely normal.

Paralysis of the facial (seventh) nerve—the motor nerve of the face—

DRAWINGS OF A SPECIMEN SHOWING HOW AN INFECTION PASSED UPWARD FROM A CARIOUS TOOTH TO THE NOSE BY WAY OF THE MAXILLARY ANTRUM.

FIG. 1.

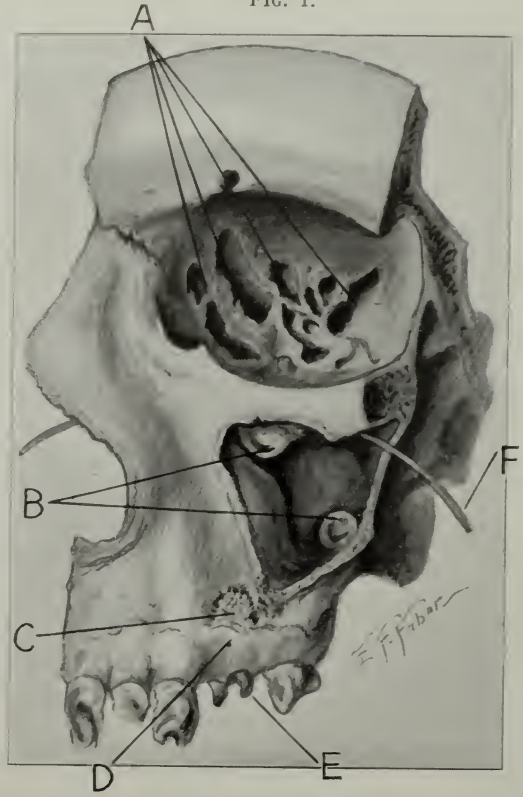

FIG. 2.

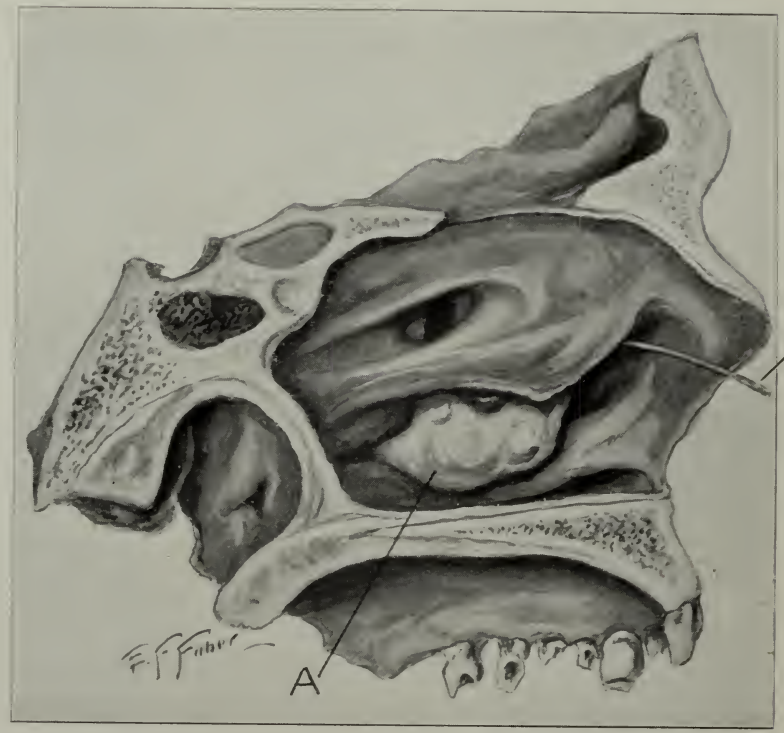

FIG. 1. A, Ethmoidal sinuses (opened from orbital aspect and found free from any evidences of disease). B, Polypi (upper one located at lip of ostium). C, Area of necrosis around tooth root. D, Fistula from tooth root opening on to gum. E, Diseased first bicuspid. F, Bristle passed from maxillary sinus into nose through ostium.

FIG. 2. A, Polypi in middle fossa of nose, growing from lip of unciform groove. B. Bristle passing through maxillary ostium —beneath middle turbinate.

may also come under the dentist's observation, involving as it does interference with mastication through paralysis of the cheek and lip muscles; and it is always to be remembered that this is very often caused by disease in the ear or mastoid cells through which the nerve passes to reach the face.

Fig. 3.

Median Section of Head, showing general relations. The position of tongue is that which occasionally occurs under deep anesthesia, showing how breathing is thus interfered with.

CASES DEMANDING CO-OPERATION OF DENTIST AND RHINOLOGIST.

Mouth-breathing in children. Cases of mouth-breathing in children, malformed palate, and nasal obstruction call for the co-operation of the dentist or orthodontist and the rhinologist. It is a fact of fundamental importance that dental regulation of the erupting teeth and the proper formation of the dental arch with proper occlusion have a primary effect on the shape of the nasal cavity and the nasal septum; but it should also be stated that many other factors are concerned in the formation and functional usefulness of the nasal cavities. Bowing of the nasal septum and ridges along its base caused by defects in eruption of the incisor teeth make a crying call for dental regulation during the period of development in childhood

—and herein lies a great hope of preventive medicine in the immediate future.

Deflected nasal septum in adults. This, however, is a different proposition altogether. Here the septum has been bent and the different parts have so overlapped each other from excessive growth in a confined space that the septum has grown firmly into a distorted shape and would not spring back into a straight line even if the hard palate were entirely removed. The septum in this case is like a broken bone which has grown together in a bent position, with thickening at the point of bending. For this condition rhinologists possess an ideal operation—the submucous resection of the septum. This operation is done under cocain anesthesia, and absolutely without pain, and without disabling the patient restores his septum to the normal at once. It is necessary to state that these truly brilliant results are only obtained uniformly by thoroughly trained hands; and much discredit can possibly be brought to this operation, as to tonsillectomy, in the hands of thoughtless and shortsighted operators. No dentist or orthodontist need hesitate to heartily recommend this operation to any patient needing it.

I would call the attention of orthodontists and dentists to the fact that unlimited increase in the width of the nasal cavity is not always to be desired; a too wide open nose is almost as undesirable from a functional standpoint as a contracted nasal cavity—producing, in fact, practically the same effects as mouth-breathing, *i.e.* by allowing the air to rush on into the lungs before it is properly warmed and moistened by contact with the nasal mucosa. I believe that in the class of cases in which spreading of the dental arch is usually undertaken there is little danger of surpassing normal limits.

The nasal accessory sinuses (of which the antrum or maxillary sinus is one) require a deeper knowledge and experience on the part of the rhinologist in their proper treatment than in that of almost any other part.

Antrum infections. The antrum, being in relation to the roots of the teeth along its floor, has one more source of infection than the other sinuses, and is thereby brought within the dentist's and oral surgeon's sphere.

Rhinologists are ready to co-operate with the dentist or oral surgeon in the treatment of the antrum, and by their ability to treat this cavity through its nasal wall have what, for many conditions, is a simpler and better method than treating this cavity through the alveolus. Where a general infection of the antrum is suspected, a simple puncture of the antrum through the nasal wall with a suitable hollow needle under cocain anesthesia allows us to wash out the cavity and at once show positively whether or not it contains pus. With the same kind of local anesthesia, a large permanent opening can be made along the floor of the naso-antral wall for drainage. The usual Caldwell-Luc operation through the front wall behind the canine tooth is wisely reserved for cases in which simple drainage is insufficient.

Rhinologists see many cases of antrum infection following similar infections in the nose, especially after la grippe, in which there seems to be no involvement of the teeth, and others in which there is pain in the teeth apparently due to irritation of the dental nerves within the antrum. Too great care cannot, however, possibly be taken in searching for a dental origin for all antrum infections; and I have seen cases clear up immediately after extraction or attention to the offending tooth.

Considering that the antrum is a part of the nasal cavity, we find that when it is infected it is often only a part of an infection involving other of the accessory sinuses as well. Thus pus from the sinuses higher in the head may and does drain into it; in which case the antrum acts as a reservoir for the pus formed elsewhere—and it is the duty of the rhinologist to follow the pus to its source.

A case of antrum suppuration in a woman seventy-six years of age now under my care, who has been without

teeth for years, and whose alveolar processes show no signs of old roots or fistulas, is an example of maxillary sinusitis not associated with dental caries. In such cases in elderly persons the possibility of a malignant growth within the antrum should always be borne in mind. I have seen a carcinoma beginning within the antrum giving at first only signs of a suppuration in that cavity. This case had also a fistula in the region of a molar tooth discharging a thin, foul-smelling, and (to the patient) foul-tasting pus. Later this cancer involved the orbit and ulcerated through the cheek.

Dentists must frequently see patients who are extremely uncomfortable in the dental chair on account of mucus and pus dropping down into the pharynx while the head is thrown back. These are usually cases of nasal catarrh or sinusitis that throw off a discharge which falls down the pharynx—conditions which can always be relieved and usually cured. Sore throat and hoarseness as well as indigestion are often due to the constant dripping of this infected matter down the pharynx from the nose.

FOREIGN BODIES IN THE LUNGS AND ESOPHAGUS.

With the bronchoscope, the esophagoscope, and the suspension laryngoscope, the laryngologist can now view and remove foreign bodies from the lungs and esophagus. Dr. Jackson of Pittsburgh, the leading American authority on bronchoscopy, reports the removal of a dental broach from one of the terminal bronchioles in the lung.

A dental friend of mine allowed a broach with a cuff on it to slip from his fingers while working in the patient's mouth; the patient thought it had stuck in his larynx, but examination did not discover it. An X-ray also failed to show it in the throat or thorax, and on the next day it passed out of the distal end of the patient's intestinal tract without trouble; and the dentist now has the broach in his instrument case as a memento.

Finally, I would remark that there is a field for the use of the dentist's gas-oxygen apparatus in the office work of the medical man, and where dentists and M.D.'s are located convenient to each other in practice this can be used with profit to both.

For opening the drum membrane and incising furuncles in the ear canal—places where local anesthetics fail—gas-oxygen anesthesia in the office avoids a trip to the hospital or an otherwise very painful procedure, and is one of many occasions in which dentists and M.D.'s may well work together.

FURTHER STUDIES ON NOVOCAIN-SUPRARENIN ANESTHESIA.

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(Read before the Northeastern Dental Association, at its annual meeting, Boston, Mass., October 15, 1914.)

[*Continued*—see COSMOS for December 1914, vol. lvi, p. 1320.]

(II.)

NEXT in importance to the sterility of the anesthetic solution and the instrumentarium is the preparation of the field of injection.

PREPARATION OF THE FIELD OF INJECTION.

While it is manifestly impossible to sterilize the oral cavity, we can always succeed in sanitation of the mouth and in rendering the micro-organisms innocuous for a sufficient length of time to allow the introduction of the anesthetic solution without contamination. Spraying of the patient's mouth with a mildly antiseptic solution of pleasant taste or with normal salt solution delivered by a compressed-air atomizer, which should be a routine measure preceding any dental operation, is especially indicated in the practice of local anesthesia.

To prevent the introduction of micro-organisms or their toxins from the mucosa into the deeper strata of tissues, Fischer, in compliance with a generally followed surgical practice, recommends the application of iodin and aconite, equal parts, upon the previously dried mucous membrane. The aconite, however, imparts hardly any virtue to the iodin, since aconite has no value as a disinfectant, and its depressant effect upon the peripheral sensory nerves requires some time to become established. On the other hand, aconite is highly toxic, and when introduced into a wound produces a peculiar constitutional effect. The Dispensatory of the United States distinctly warns that "Care should be taken not to apply aconitin to an abraded surface or to mucous membrane, for fear of poisoning." Considering these drawbacks, which have been pointed out also by Camnitzer* and Blaaberg,† and for which the theoretically correct but practically slow anesthetic action of aconite on the mucous membrane in no way compensates, the omission of aconite is not only justified, but desirable.

Even in the application of tincture of iodin to the mucous membrane, in analogy with its routine application in surgery preceding incision into the skin, judgment is required. In the first place, tincture of iodin deteriorates very rapidly, forming hydriodic acid; hence, as Abel states it,‡ one week after preparation it becomes an irritant, and after one month a caustic, destroying the epidermis. Again, in children and delicate persons even fresh tincture of iodin sometimes produces blistering and ulcers (see F. N. Doubleday, in *British Dental Journal*, February 15, 1915, p. 159); and lastly, the patient may have an idiosyncrasy for iodin. An interesting treatise on "The Local Preparation

* *Deutsche Zahnärztliche Wochenschrift*, July 18, 1914.

† *British Dental Journal*, February 15, 1915.

‡ *Archives de Médecine et de Pharmacie Militaire*, abstract in DENTAL COSMOS, July 1914, p. 885.

of Patients for Operation," by A. D. Whiting, M.D., was published in the *Journal of the American Medical Association,* August 8, 1914, p. 474, which in this connection deserves special mention. G. Zanetti* found, after testing various substances as a vehicle for iodin, that benzol dissolves iodin rapidly, and the solution keeps indefinitely, while the benzol seems to enable the iodin to penetrate more deeply. The saturated solution contains 9.75 per cent. iodin, while tincture of iodin represents less than this.

Decolorized iodin in the form of diiodo-hydroxy-propane, or iothion, has the advantage of containing up to 70 per cent. iodin in combination with alcohol and glycerin; it penetrates the gingivæ more deeply without damaging the mucosa, and is applicable even in cases of pronounced idiosyncrasy for iodin. I have found it to be of great value also in cases of periosteitis, stomatitis, and gingivitis, and the cleanliness of its application and freedom from decomposition render it preferable to ordinary tincture of iodin in all dental operations.†

Decolorized iodin, moreover, facilitates the observation of the gradual advance of anemia of the gingivæ following infiltration, which, to the trained eye, is a valuable symptom for gaging the depth of the anesthesia. Moreover, the break in the chain of asepsis, which is so often made by practitioners who merely wash their hands with water and soap before making an injection, is prevented if the operator's palpating finger or preferably his hands are painted with iothion in olive oil. This form of sterilization also augments the delicacy of the sense of touch, and is therefore preferable to the application of collodion for this purpose as suggested by Bolten-Husum.*

For the beginner in local anesthesia, however, the iodo-benzol seems preferable until the individual steps of the technique have become routine practice, as by its color it indicates the fact that the sterilization of the mucosa has not been overlooked, and marks the area for insertion of the hypodermic needle. Iodo-benzol, moreover, by its slightly escharotic action and burning disguises the slight pain incident to the needle-prick, which, for very excitable patients, should be rendered entirely painless by swabbing the place of injection with 30 per cent. pure novocain solution or by dissolving and distributing by rubbing with a large ball-burnisher a novocain-suprarenin pluglet as used in pressure anesthesia. Great care is necessary not to apply too much iodo-benzol, as any surplus reaching the soft palate, tonsils, or back of the tongue will set up an extremely disagreeable irritation.

PRESSURE ANESTHESIA FOR THE EXTIRPATION OF PULPS.

While absolutely painless extirpation of the pulp can be achieved very easily either by infiltration or conductive anesthesia, the technique of pressure anesthesia as familiar for years with cocain can be most advantageously employed by using the novocain-suprarenin pluglets especially designed for this purpose. For confining the anesthetic in the cavity and distributing the pressure evenly, unvulcanized weighted rubber is preferable to ordinary unvulcanized rubber. These pluglets are also of great service in desensitizing hypersensitive dentin, the hypersensitive area being dried and one pluglet being vigorously rubbed into it with a ball burnisher moistened with oil of cloves.

Since the question as to who first suggested the method of pulp extirpation

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* "Iodized Benzol as a Substitute for Tincture of Iodin for Sterilization of the Skin," *Il Policlinico,* Rome, vol. xxi, No. 15, p. 521. Also, Dr. G. Cremonese's studies on "Iodobenzin," abstract in *British Dental Journal,* February 1915, p. 131, and M. Pezzolo and Alcock, on "Iodin in Methylic Alcohol," *Lancet,* London, April 10, 1915, p. 764.

† See also essays by L. Klein, *Oester.-Ungar. Vierteljahrsschr. f. Zahnheilkunde,* No. 1, 1907, and E. Jaeger, *Deutsche Zahnärztl. Wochenschrift,* vol. xv, No. 47.

* *Correspondenz-Blatt f. Zahnärzte,* April 1914, p. 103.

by cocain-pressure anesthesia still seems to be a mooted one, it may not be amiss in this connection to review the literary evidence. The *Dental Review* of March 15, 1905, page 261, published an account of a "Symposium on the Removal of Pulps," held by the Odontographic Society of Chicago on January 16, 1905, when Dr. L. L. Funk of Chicago reported that early in 1892, after various experiments with cocain, one of which was for the desensitization of a wart on his own knuckle, in which pressure was exerted on a pledget of cotton saturated with a 10 per cent. solution of cocain by a rubber tube placed over the stem of a chip-blower, it occurred to him that "a cavity in a tooth was advantageous to this operation, from the fact that the walls of the cavity would confine the medicine." Subsequently he "placed the cocain in the cavity, covered it with a piece of soft rubber, using a burnisher to force the cocain in, and took the pulp out without pain."

In the DENTAL COSMOS for December 1892, page 992, Dr. Edward C. Briggs described his method, which consisted in exposing the pulp, then applying on cotton some freshly prepared 20 per cent. solution of cocain hydrochlorid. With a hypodermic syringe, mounted with the point of a Dunn syringe, gradual pressure was exerted over the point of exposure, "carrying the solution up and around the pulp to its extreme end." Apparently the first full description of the method now in vogue, which is essentially that of Dr. Funk, was given by Dr. B. S. Hert of Rochester, in the DENTAL COSMOS, March 1902, page 275, in a paper on "Cocain in Pulp Extirpation," the writer claiming no originality, saying, "It is almost two years since I learned of this manner of using cocain."

THE TECHNIQUE OF INJECTION.

The technique of injection is entirely based upon anatomic considerations which, for our special purpose, have been worked out *in minutiis* by Braun, Fischer, and the latter's former assistants, Bünte and Moral. It lies outside the scope of this paper to repeat the anatomic description of our field, except as far as some disputed points are concerned. Any text-book on anatomy in general, or on local anesthesia in special, also many of the essays which have appeared within recent years in American dental journals, offer ample information on this phase, though it should be remembered that a great many writers offer the findings of Braun and Fischer as their own, according to the most reprehensible habit of many dental writers who invariably fail to give credit where credit is due. In the following, an attempt will be made to tabulate in a terse manner the various factors that make toward a successful application of local anesthesia.

INFILTRATION OR MUCOUS ANESTHESIA.

The maxilla, owing to the liberal distribution of spongiose, greatly canaliculated, or cancellated areas throughout its superficial cortical layer both facially and palatally, lends itself most favorably to mucous or infiltration anesthesia, allowing of the ready anesthetization of each individual upper tooth, at any age. In the mandible the cortical layer prevails, increasing in general distribution and density with advancing age, so that infiltration anesthesia is uniformly successful only in children up to twelve years of age, while in persons above twelve years this method is applicable only for the anesthetization of the centrals and laterals, the osseous environment of which teeth to some extent retains its cancellated character. The mandible, therefore, may be said to be the field *par excellence* for conductive anesthesia, especially since it is difficult to make an injection in the lingual surface owing to the continuous interference by the tongue and the continual inundation of the field of injection by saliva from the sublingual glands.

Infiltration or mucous anesthesia is best accomplished by using the short needle of 23 millimeter length and 0.47 diameter in the short hub, though, after some practice, the operator will acquire

sufficient skill to enable him to use the long needle of 42 millimeter length and 0.47 millimeter diameter for infiltration as well as for conductive anesthesia. With the patient sitting erect for injection labio-bucally (dental anesthesia), or greatly reclined for injection palatally (surgical anesthesia), the operator, standing in front of the patient, inserts the needle half-way between the cervical margin and the probable root-apex of the tooth mesially to its long axis at as nearly a right angle as possible to the bone, holding the syringe around the barrel in penholder fashion, and then penetrates with the needle to the bone—this being the shortest, hence least painful, way to the periosteum. He then retraces his fingers along the syringe barrel so that the second and third fingers come to lie against the cross-bar, the thumb over the crutch-shaped handle of the syringe, and injects two or three drops of solution. As soon as a slight whitening indicates the establishment of anesthesia around the point of insertion of the needle, the barrel is declined and the needle is very slowly advanced toward the supposed apical root-end of the tooth to be anesthetized, a drop of solution being pushed ahead of the needle-point so that its advance takes place only in fully anesthetized hence insensible tissue. The advance of the needle must be very slow, else a wheal will be raised: if this occurs it must be immediately distributed by the palpating index finger of the free hand, which continually rests over the advancing needle-point as a control, while the free fingers retract the lip to afford an unobstructed field of vision. The bulk of solution is deposited at the point nearest the root-apex of the tooth.

While infiltration anesthesia has been practiced longer in dentistry, it is by no means easier than conductive anesthesia: the injection requires a much longer time, the liability to causing some pain and tissue lesions, hence after-pain, is far greater, and the anesthesia does not last so long. Moreover, the danger of injecting into a hidden focus of quiescent chronic infection is ever present. Therefore, rather than running the risk of spreading such local infection, conductive or nitrous oxid-oxygen anesthesia should be resorted to in cases suspected or unsuspected, unless a perfectly interpretable radiogram guaranteeing the presence of normal tissue is available. A very instructive illustration of a local infection being spread systemically by infiltration in a pyorrheal mouth is furnished by J. S. Marshall's "Text-book of Operative Dentistry," third edition, 1915, p. 646, though this writer wrongly attributes the toxic symptoms to the anesthestic, making the—for an author of a dental text book—astonishing remark, that the patient, who was no other than that writer himself, was enjoying perfect health. We surely have, within recent years, come to regard the pressence of pyorrhea of any degree in any mouth as a serious disorder, and the symptoms reported by Marshall are unmistakably pathognomonic of septicemia.

DENTAL VS. SURGICAL ANESTHESIA.

The description just given of the technique of infiltration anesthesia applies to anesthesia for dental purposes, viz, the extirpation of a pulp, the excavation of hypersensitive dentin in cavity preparation, the preparation of a vital abutment in crown and bridge work, etc. This aim is attained by the anesthetic solution paralyzing for a time the sensory nerve branches and terminals in the mucosa, gingivæ, and periosteum on the labio-buccal side, and the pericementum, alveolus, and pulp of the tooth injected. In order to obtain surgical anesthesia, however, for the purpose of extraction, curettage, alveolotomy, or any surgical operation, sensation in the palatal and lingual mucous membrane, gingivæ, and periosteum, as furnished in the maxilla by the posterior and anterior palatine nerves respectively, and in the mandible by the lingual nerve, must be abolished. This is achieved by injecting a few drops of solution about one centimeter above the cervical margin palatally of the tooth to be operated on surgically. Again the needle is introduced at as

nearly a right angle as possible. No further advancement of the needle is needed, as the palatine surface of the alveolus is far more richly cancellated than the facial portion, and anesthesia is very quickly established as evidenced by the rapid appearance and spread of the anemic area. This injection palatally is indispensable in surgical operations, as defined, since encroachment upon tissue innervated by the palatine or lingual nerves will cause pain, hence entirely defeat the object of painlessness so far as the patient's feelings are concerned. The purpose of the proposed operation, therefore, viz, its purely dental or surgical nature, must determine the procedure of injection.

ADJUVANT PRESSURE ANESTHESIA IN PULP EXTIRPATION.

In infiltration anesthesia for the extirpation of the pulp in upper molars, it sometimes happens that the pulp in the palatal root retains some degree of sensitivity. It is therefore advisable, in these teeth, either to employ infiltration palatally, or to resort to adjuvant pressure anesthesia. This requires very little more time, and insures entire painlessness, the main object, viz, painless opening into the pulp chamber, which is the part of the procedure most dreaded by the patient, always being obtained by infiltration. The adjuvant application of pressure anesthesia in pulp extirpation is also sometimes indicated when slight sensitivity is left in the root-canal portions of pulps in teeth which have been anesthetized, several at once, by conductive anesthesia, the nerve terminals in the dental pulp seemingly retaining sensitivity the longest. After extirpation of the pulp, which with clever manipulation of the pulp extractor comes away in bulk, the root-canal should be completely cleansed of all the accessory fibrils which can be reached, and dressed with campho-phénique, otherwise sensitivity may be encountered at the next sitting, evidently owing to irritation of the telo-neurons remaining vital in the dentin.

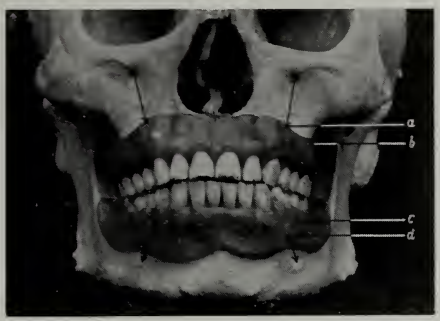
CONDUCTIVE ANESTHESIA.

While infiltration anesthesia is essentially of a terminal or peripheral nature, conductive anesthesia aims to intercept or block at a convenient point a sensory nerve before it reaches and distributes itself in the area which its branches supply with sensation. For our purposes, fortunately, it is unnecessary to carry our solution directly into the nerve trunk, viz, make an endoneural injection, as applied in general surgery, since the nerve branches in our special field are slender enough to absorb and conduct the novocain-suprarenin solution, for which they exhibit a peculiar avidity. If the correct technique of perineural injection is followed, therefore, the puncturing of nerve trunks, with subsequent temporary or permanent paralysis of the punctured nerve, should not occur. Such an accident is all the more inexcusable, since our depots of solution are laid in the vicinity of foramina with a liberal super-layer of fatty and connective tissue into which the nerve as well as any bloodvessels have ample space to escape, unless the needle is inserted with an unduly fast stabbing motion. By holding the syringe barrel in penholder fashion, and advancing the needle on the surface of the bone in the manner of a delicate probe, and injecting with a slight in-and-out motion, such accidents can be entirely precluded. If paralysis of a nerve should occur, stimulation by daily massage and electric treatment will hasten the regeneration of the nerve. Similar treatment combined with local absorbent medication is indicated in case of puncture of a bloodvessel with subsequent extravasation of blood as evidenced by discoloration. Absolute asepsis of the needle and solution are ideal guarantees against complications in such eventualities—of which, fortunately, but a small number have so far been reported.

The technique of conductive anesthesia is best acquired by practice on green skulls, which are injected with a staining solution and subsequently dissected.

In this way the operator acquires a thorough knowledge of the anatomy of the field of injection and operation, of the diffusion of the solution in the tissues, and invaluable confidence. It is also good practice to reconstruct the gingival tissue in a dry skull with wax, up to the reflection of the mucous membrane, and to acquire in this way a familiarity with the points of insertion of the needle and the manner of advancing upon the surface of the bone. (See Figs. 9 to 12.) The foramina to be considered in conductive anesthesia, the landmarks for the correct location of the needle puncture, the direction and depth of the advance of the needle of 42

Fig. 9.

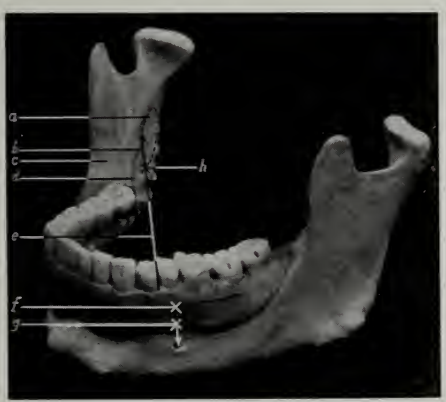


Gingivæ up to reflection of mucous membrane reproduced in wax (also Figs. 10, 11, and 12). *a*, Insertion and line of advance of needle for infra-orbital injection. *b*, Point of insertion of needle for tuberosity injection. *c*, Point of insertion of needle for buccinator injection. *d*, Insertion and line of advance of needle for mental injection.

Fig. 10.

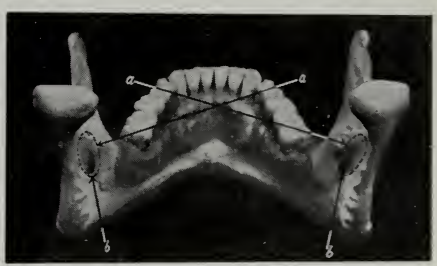
Palatine surface (surgical anesthesia). *a*, Point of insertion of needle for naso-palatine nerve. *b*, Line of demarkation between areas supplied by naso-palatine and anterior palatine nerves. *c*, Point of insertion of needle for tuberosity injection. *d*, Point of insertion of needle for anterior palatine nerve.

Fig. 11.



Injections in the mandible. *a*, Pterygo-mandibular sulcus. *b*, Lingula over which needle should glide. *c*, *d*, External and internal oblique lines forming retro-molar triangle. *e*, Direction of needle for mandibular injection. *f*, Point of injection and direction of needle for buccinator injection. *g*, *Ditto*, for mental injection. *h*, Depth of needle for injection of lingual nerve (line foreshortened).

Fig. 12.



Lingual aspect of mandible. *a*, Direction of needle and syringe for mandibular injection. *b*, Direction of needle for extra-oral injection of mandibular nerve.

millimeter length in the long hub, the position of the patient's head and mouth, and the quantities of solution injected, are indicated in the following brief directions. In regard to the quantities of anesthetic solution, it should be remembered that the more perfect the operator's technique the less solution will be required to obtain anesthesia.

Brief Directions for Conductive Anesthesia.

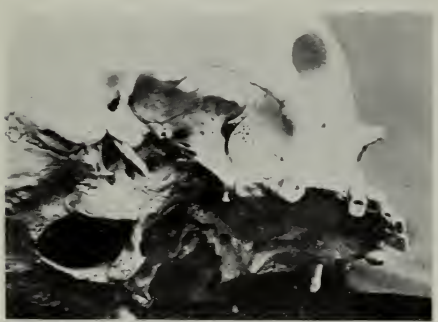
FORAMINA—ANATOMIC LANDMARKS—ADVANCE OF NEEDLE—MANIPULATION OF PATIENT'S MOUTH—QUANTITY OF ANESTHETIC SOLUTION.

A—Maxilla.

I. FACIAL SURFACE.

(1) *Posterior and middle superior alveolar foramina,* located back of maxil-

FIG. 13.

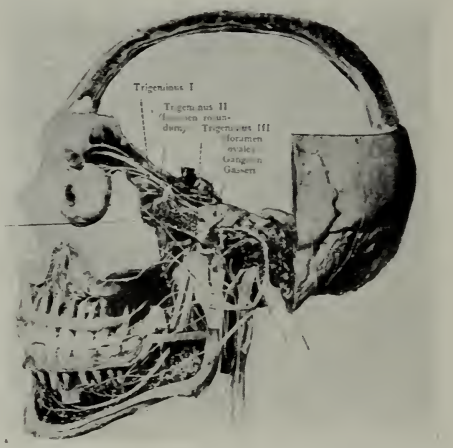


Side view of skull, showing pterygo-palatine canal, cribriform plate where posterior and sometimes middle superior alveolar nerves enter the body of the bone. Method of tuberosity and infra-orbital injections indicated by arrows.

lary tuberosity below and behind zygoma, giving passage to posterior and middle superior alveolar nerves innervating soft tissues facially, bone and pulps of first, second, and third molars, and first and second bicuspids. (See special paragraph, on page 852, and Figs. 9, 10, 13–15.)

The needle is inserted in the reflection of mucous membrane back of distal root of first molar, and advanced, on bony surface—without discharging solution—in an upward, backward, and inward

FIG. 14.



Distribution of trigeminal nerve. Horizontal line indicates foramen rotundum. (Hirschel.)

direction. When the needle is inserted to full length, a depot of solution is made. If the bicuspids also are to be

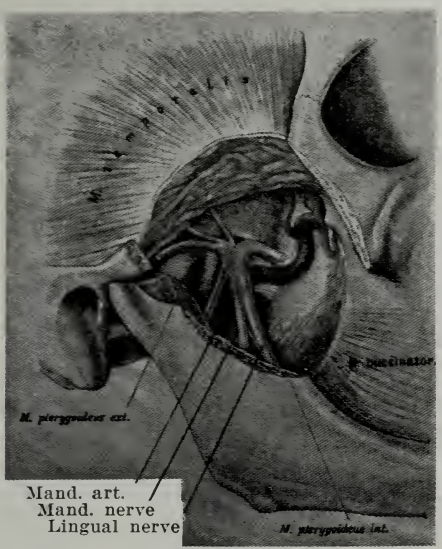
FIG. 15.

Topography of maxillary tuberosity, with special consideration of the nerves and blood-vessels at the ascending ramus. (Gasser.)

anesthetized, 1 cc. of solution is discharged as the needle is withdrawn. Patient's head reclined, mouth closed,

cheek retracted. Quantity of solution: 2 cc. (full syringe).

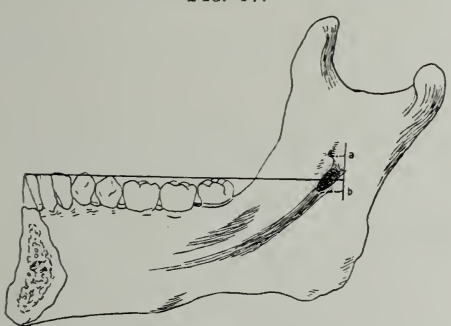
Fig. 16.



Dissected specimen showing relative situation of lingual and mandibular nerves and mandibular artery in pterygo-mandibular space; also absence of danger of puncturing mandibular artery with slow and cautious injection. (After Zuckerkandl.)

(2) *Infra-orbital foramen,* emitting *anterior superior alveolar branch* inner-

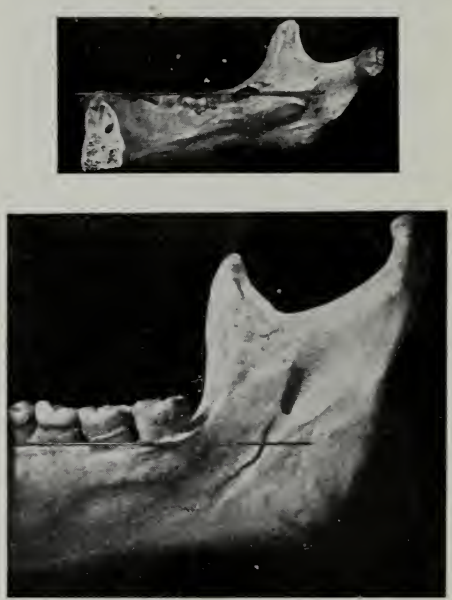
Fig. 17.



Situation of mandibular foramen. (Bünte and Moral.)

vating soft tissues facially, bone and pulps of central, lateral, and canine. Palpate lower border of orbit on face, press index finger-tip over infra-orbital foramen. Needle inserted in reflection of mucous membrane distally to canine root, advancing needle to about one-half its length while continually discharging solution until felt under palpating finger-tip. (See Figs. 9, 13, and 14.) Patient's head reclined, mouth closed, upper lip retracted with thumb. Quan-

Fig. 18.



Comparative situation of mandibular foramen in young child and adult. (Bünte and Moral.)

tity of solution: 1.25 cc. (three-quarter syringe).

II. PALATAL SURFACE.

(1) *Posterior palatine foramen,* located in palate on line joining last molar teeth present, emitting *anterior palatine nerve,* innervating soft tissues palatally from third molar to first bicuspid inclusive. Needle inserted as for infiltration of palatal root of last molar, then advanced slightly toward foramen, while discharging drops of solution.

(See Fig. 10.) Danger of going too deeply and directly into foramen. Patient's head reclined, mouth wide open. Quantity of solution: 0.25 cc. ($\frac{1}{8}$ of syringe).

Fig. 19.

Position of syringe and needle in mandibular injection.

(2) *Anterior palatine or incisive foramen,* located in median line back of incisive papilla, emitting *naso-palatine nerve,* innervating soft tissues palatally from canine to canine. (See

Fig. 20.

Position of palpating left index finger, right hand, syringe, and needle in mandibular injection.

Fig. 10.) Needle inserted a short distance anteriorly to incisive papilla, injecting under light pressure, advancing cautiously and slowly to a short distance posteriorly. Patient's head reclined, mouth wide open. Quantity of solution: 0.25 cc. ($\frac{1}{8}$ of syringe).

B—Mandible.

I. LINGUAL SURFACE.

(1) *Mandibular foramen,* in internal surface of ascending ramus, giving entrance to *mandibular nerve* into mandibular canal, innervating soft tissues facially (mostly), bone and pulps of all teeth from third molar to central incisor. From first bicuspid to central incisor, however, innervation by anasto-

Fig. 21.

Method of mandibular injection on left side.

mosis from the opposite side must be reckoned with, and abolished either by injection at mandibular foramen on opposite side or mental injection on opposite side. External oblique line is palpated in mouth, and tip of index finger held in *retromolar triangle.* Needle inserted at middle of nail of palpating finger above masticating surfaces of molars, in children and old age lower (see Fig. 18); barrel resting on first bicuspid of opposite side. (See Figs. 11, 12, 14–24.) Needle is advanced to full length before injecting. If the *lingual*

nerve, innervating soft tissues lingually, is to be anesthetized, 0.5 cc. of solution ($\frac{1}{4}$ of syringe) is discharged when needle has entered the soft tissues half-way. When injecting on the right side, operator stands in front of patient; when on left side, operator stands on right side, his arm placed around patient's head, palpating retromolar triangle with left index finger. In either case patient is seated erect, mouth wide open. Quantity of solution: 2 cc. (one full syringe).

Fig. 22.

Green skull injected with bismuth paste, and radiographed. (See also Figs. 23 and 24.) Note faulty position of needle which has missed the pterygo-mandibular space, the internal pterygoid muscle having been injected instead. (Türkheim.)

Fig. 23.

Slightly high injection. Note remarkable diffusion of bismuth paste even in dead tissue. (Türkheim.)

II. FACIAL SURFACE.

(1) *Mental foramen*, located beneath and between the roots of first and second bicuspids, where *incisor branch* of mandibular nerve, innervating bone and pulps of first bicuspid (sometimes), canine, and incisors, also *mental branch*, innervating skin of chin, skin and mucous membrane of lower lip, and anastomosing branches of inferior dental and mental nerves from the other side are blocked. Palpate foramen on face with tip of left index finger, depressing lip with thumb. Needle inserted in reflection of mucous membrane between the two bicuspids, and advanced while injecting almost vertically downward (see Figs. 9 and 11), since foramen opens distally, until the discharging solution is felt under palpating finger-tip. Operator stands behind patient, who is seated erect, mouth half open. Quantity of solution: 1 cc. ($\frac{1}{2}$ syringeful).

(2) *Buccinator nerve*, supplying the buccal mucosa of molars and bicuspids

and angle of mouth with sensory fibers. Needle inserted in second bicuspid region (see Figs. 9 and 11), half-way between cervical margin and reflection of mucous membrane, and advanced parallel with masticating surfaces of molars while continually injecting on bony surface. Injection in cheek opposite second bicuspid indicated if prolonged

FIG. 24.

Correct injection. Note diffusion of bismuth paste in pterygo-mandibular space. (Türkheim.)

operation is to be made, to avoid pain in buccinator muscle from prolonged opening of mouth. Operator stands in front of patient, who is seated erect, mouth half open. Quantity of solution: 1 cc. ($\frac{1}{2}$ syringeful).

(3) *Extra-oral anesthesia of the mandibular nerve*, indicated in cases of extensive infection of the oral cavity and of impossibility to open the mouth, as in ankylosis and fractures, and first suggested by Pehr Gadd in January 1913, may prove valuable, though not uniformly successful owing to absence of reliable landmarks. This method, which has been lately again recommended by Klein and Sicher,* is indicated in Fig. 12, *b*.

The rapidity of establishment of anesthesia following the various forms of injection, and the duration of the anesthesia, greatly depend upon the perfection of the operator's technique and the patient's individual susceptibility. The former can be advantageously enhanced by digital or vibratory massage of the injected tissues when accessible. The depth of the anesthesia should always be tested by a suitable sharp instrument before proceeding to operate.

THE MIDDLE SUPERIOR ALVEOLAR NERVE.

In the above table all undue detail has been purposely avoided. The special anatomy of the field involved, an intimate knowledge of which is not only the *sine qua non* of success, but a duty toward the patient, can be studied in any text-book on general anatomy, or in text-books on Local Anesthesia, such as Braun's, and Allen's for general, Lederer's and Fischer-Riethmüller's for dental surgery, and in Blum's article on "Conductive Anesthesia," published in *Dental Summary*, February 1915, at page 95. In the last article is also found a *résumé* of the widely diverging opinions of anatomists regarding the course of the middle alveolar dental branch. In most cases I have been able to anesthetize the three molars and both bicuspids together by an ordinary tuberosity injection, which must be due to the fact that the middle branch enters the body of the bone either in the cribriform area indicated in Fig. 13, or in foramina situated anteriorly thereto; in the latter case the middle branch is anesthetized by the depot of solution laid in withdrawing the needle. (See

* "Percutaneous Conductive Anesthesia of the Inferior Alveolar Nerve," by Dr. N. Klein and Dr. H. Sicher, *Oesterr.-Ungar. Vierteljahrsschr. f. Zahnheilkunde*, Vienna, January 1915, p. 36.

description in table—A. I. (1), page 848.) If either of the bicuspids or both persist in remaining sensitive following tuberosity injection, infiltration facially between the first and second bicuspids, or infra-orbital injection for the first bicuspid, will solve the problem. An improvement in the technique so as to afford safe anesthesia simultaneously of the posterior, middle, and anterior superior alveolar nerves by one injection high up in the pterygo-palatine canal has not as yet been devised, but may not be far from realization.

CONCLUSION.

In conclusion, I cannot warn too emphatically against the haphazard and careless use of local anesthesia by unskilled operators, and against blind fanaticism tending to cast aside and even discredit older and equally well-tried methods of anesthetization. An effort to prove the indispensability of general anesthesia by nitrous oxid and oxygen and local anesthesia by novocain-suprarenin, respectively, in dentistry is presented in my paper on "Anoci-Association in Dentistry," DENTAL COSMOS, July 1915, page 742, where also notes on pre-operative, restorative, and post-operative measures may be found. An exceptionally intimate familiarity with the immense bulk of medical and dental literature on this subject, both domestic and foreign, has convinced me of the correctness of my former statement that "No dental operator who is familiar with but one method should consider himself competent in anesthesia, nor can any dental office which offers anesthetic facilities of but one kind be regarded as efficiently equipped."

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE THERAPEUTIC ACTION OF BUCKLEY'S DESENSITIZING PASTE.

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(Read before the Susquehanna Dental Association of Pennsylvania, at its annual meeting, Wilkes-Barre, May 18, 1915.)

WITHIN the last six months the writer has received numerous written and oral communications requesting his opinion relative to the action of Buckley's desensitizing paste. To formulate an opinion about a mixture of drugs advocated as a specific for an existing pathologic condition, although the action of each single drug is known, necessitates an investigation of the pharmacologic action of the drug mixture relative to the pathologic condition for which it is advocated. In the following discussion an effort is made to explain the action of Buckley's desensitizing paste on a rational basis.

Concerning an investigation of a so-called new remedy, the writer recapitulates what he has said on a former occasion* in regard to rules governing methods of research: (1) Generally known observations or facts are collected; (2) hypotheses are drawn from these observations and are explained; (3) other crucial facts (experiments) are collected to test these hypotheses, and (4) a second set of facts is collected, and from it are drawn final conclusions or verifications. Omitting one of these rules or applying illogical reason-

* "On the Therapeutic Action of Phenolsulfonic Acid." DENTAL COSMOS, April 1912, vol. liv, p. 397.

ing based on analogy, or inductive instead of deductive methods, leads to a false analysis of the problem under consideration.

In his communication, "Desensitizing Paste—A New, Safe, and Reliable Remedy for Hypersensitive Dentin."* Dr. Buckley has neglected to comply with rules one, two, and three, and the only statement made by him concerning the generally known observations of the chief ingredient of his paste, *i.e.* formaldehyd, he expresses as follows: "I have known for some time that formaldehyd would desensitize dentin."

Before discussing the literature on the subject it is preferable to know the nature or the formula of the compound under consideration. In writing out a formula for a medicinal compound at present it is customary in the United States and other civilized countries to enumerate the various ingredients, including their respective quantities, in rotation. Dr. Buckley presents the "Analysis of Formula of Desensitizing Paste" in the following manner: "The formula for desensitizing paste, the name which I have given the remedy, contains neothesin, thymol, and trioxymethylene, in the proportion of eleven, twelve, and seventy-seven parts, respectively, all combined with a petroleum base and incorporated in a fibrous vehicle and colored with an insoluble pigment. One grain of the preparation is sufficient for about fifteen applications. On this basis the amount necessary for one application contains neothesin 1/300 grain, thymol 1/270 grain, and trioxymethylene 1/43 grain."

The writer has submitted the "analysis of formula of desensitizing paste" to a pharmaceutical graduate, a physician, and a dentist, respectively, asking these professional men individually to write out the formula as they comprehend it in terms according to standard rules. All these reports were uniform and tallied with the writer's figures. In modernized English the formula of the Buckley's desensitizing paste reads as follows:

Neothesin,	3 gr.
Thymol,	3⅓ "
Trioxymethylene,	21 "
Vaselin, q. s. to make	1 dram.

The "fibrous vehicle" and the "insoluble pigment" play no part in the therapeutic action of the compound, and consequently they are omitted in our discussion.

LITERATURE ON FORMALDEHYD AS A DESENSITIZING AGENT.

International dental literature of the last decade is filled with references relative to the use of formaldehyd as a desensitizing agent. It is out of place to enumerate all of these references; merely to cite a few, the writer has selected at random a reference from an American, from a French, and from a German dental journal.

"New Methods of Dentinal Anesthesia," by G. Mahé, M.D., Paris, DENTAL COSMOS, February 1904, p. 113:

> Dr. Rodier of Paris has recommended a method of obtunding sensitive dentin which consists in the employment of a paste of equal parts of formalin and creasote and one per cent. trioxymethylene. This paste is left in the cavity for two or three days under a gutta-percha filling. The application is followed by intense pain which may last from one to ten hours. This is followed by an absolute insensibility of the dentin. According to Dr. Robin, under the influence of this combination it is possible to excavate the dentin without causing any pain whatever, and my own experiences confirm Dr. Robin's observations. He believes that here formol acts by "fixing" the ends of the dentin fibrillæ, thereby preventing the transmission of impulses.
>
> But we fear that formol has a tendency to devitalize the tissues upon which it is applied, and especially the central organ, *i.e.* the pulp, for as it happened to Dr. Robin and to myself —we found that after the application of this dressing we could enter a pulp chamber without exciting any pain whatever, and this of course indicates that the vitality of the pulp has been impaired by the action of the formol. If, however, the application be not allowed to remain in the cavity for more than twenty-four hours, the action of the drug is superficial and the deeper layers of dentin exhibit a certain degree of sensitivity. . . .

* *Items of Interest*, December 1914.

The preparation which I am using at present is as follows: Crystallized menthol 5 parts, crystallized phenol 4 parts. This pheno-menthol mixture is a syrupy liquid at ordinary temperature, and may be made into paste before using by mixing it with equal parts of trioxymethylene and orthoform.

Journal Odontologique de France, May 1910, "A Few Indications for the Use of Trioxymethylene," by M. Thomas:

Trioxymethylene has been employed in the second exposure degree—of dental caries—to overcome dental hyperesthesia. It is employed as follows: Trioxymethylene, one part; zinc oxid, four to six parts; phenol, enough to make a stiff paste. If one incorporates into this paste cotton fibers, he obtains a small pellet, which facilitates the placing and removal of the dressing.

In his commendable brochure, "The Hypersensitive Dentin and Its Treatment," Berlin, 1899, Professor Walkhoff makes the following statement concerning formaldehyd:

I have here to record at once the use of formaldehyd as a remedy which soon after its introduction was recommended for the treatment of hypersensitive dentin. In the beginning, apparently, the results obtained were remarkable, more so when applied in its concentrated form, *i.e.* the commercial forty per cent. solution. It produces a deep anesthesia of the dentin. But exactly as in the case of arsenic, very soon deleterious results were observed. I am sorry to say that the operators have had no clear conception of the action of concentrated formaldehyd on living tissues. A single microscopic examination would have been sufficient to show that the thus treated intercellular tissues would shrink and incidentally become torn and swollen. Such a picture would have at once prognosticated a failure. The complete procedure of the action of such a compound consists of a devitalization, or even in a hardening, of the treated organic tissues, or, as the microscopist expresses it, in a "fixation." The odontoblasts which have been exposed to this compound are killed.

From the foregoing review of current literature it is but clear that virtually all the various components of Dr. Buckley's "new formula" have been employed within the last ten years for the very purpose for which he recommended his compound. In view of these enumerated literary excerpts, the writer fails to comprehend the latter paragraph of Dr. Buckley's statement: "Though my work has been a labor of love, it has not been easy."

PHARMACOLOGY OF DESENSITIZING PASTE.

Regarding the pharmacologic action of this paste, Dr. Buckley makes the following statement: "It is highly essential that we understand how the desensitization is brought about when desensitizing paste is applied to the dentin. The neothesin applied directly to the exposed sensitive fibrillæ acts quickly thereon and temporarily paralyzes the ends thus exposed. The thymol volatilizes and permeates the softened dentin. The heat of the body gradually liberates formaldehyd from the trioxymethylene, which gas diffuses through the decayed dentin, combining chemically with the amino group of the protein constituent of the dentinal fibrillæ."

Before entering on a discussion of the pharmacologic action of the various drugs constituting this compound, it is essential to have a clear understanding of the methods of treatment of hypersensitive dentin. The pathology of the latter may be omitted at this moment; it suffices to say that the primary symptom of the exposed dentin is pain. The present method in vogue for the treatment of hypersensitive dentin consists in the application of drugs and in surgical procedures. For obvious reasons the discussion of the latter procedures is omitted at this moment. The application of drugs resolves itself in the utilization of two distinct pharmacologic groups, anesthetics and caustics. Anesthetics are classified as *local* and *general* anesthetics. The latter group does not play any part in our present consideration. Local anesthetics are agents which are employed for the purpose of producing insensibility to pain in a circumscribed area of tissue; they must be absorbed to bring about their typical effect. Pharmacologically they

act by temporarily paralyzing the nerve endings; the latter recover their normal physiologic function after the effect of the anesthetic has passed off. Caustics are substances which destroy living tissue by virtue of their coarse chemic or physical action, affecting organized as well as unorganized albumin. Pharmacologically they act by killing the albumin molecule.

Trioxymethylene does not possess any local anesthetic properties, while thymol is classed secondarily as a "painful" anesthetic, *i.e.* its mild anesthetic action is preceded by intense irritation. In the quantities present in the desensitizing paste it possesses no anesthetic action. Dr. Buckley relies solely on the effect of neothesin as an anesthetizing agent, stating that "Neothesin applied directly to the exposed dentinal fibrillæ acts quickly thereon, etc." If this conception were true the object sought after would be accomplished. The chemic nature of neothesin is not known to the writer. If, however, we take cocain hydrochlorid as the prototype of a local anesthetic, the writer [Prinz] has found that experimentally one-tenth of a grain —0.006 gm.—is the smallest quantity which produces any recognizable local anesthetic effect when injected into the soft tissues. The same quantity sealed into a cavity of a tooth has absolutely no effect, as any practitioner with only a limited experience in dentin anesthesia will know; 1/300 of a grain of cocain hydrochlorid in solution placed upon the tongue does not produce any appreciable sense of anesthetic action.

While the writer has no acquaintance with the mystic neothesin, he judges from the formula as given by Dr. Buckley that it belongs to the orthoform or the novocain group. If this is true, the writer [Prinz] denies that 1/300 of a grain of neothesin sealed into a cavity produces any recognizable pharmacologic action. (See below.)

Dr. Buckley has added thymol to his paste to assist the sterilizing effect of formaldehyd gas. He claims that in one application he has 1/270 of a grain of thymol and 1/43 grain of trioxymethylene. The relative strength of these two antiseptics, according to Walter (*Zeitschrift fuer Hygiene,* 1896), is recorded as follows: Formaldehyd solution inhibits the growth of staphylococcus germs in dilution of 1:10,000; thymol inhibits the growth of these same germs in dilution of 1:5000; or, according to the amounts present in the paste, formaldehyd as compared to thymol relative to germicidal actions is represented in the proportions of 77:6. Incidentally, this action of formaldehyd refers to the liquid preparation only; trioxymethylene, which represents three molecules of the gas in solid form, is proportionately stronger. To illustrate this action of the two drugs, in the relationship represented in the desensitizing paste, by a crude simile, one may think of a big gatling gun assisted in its action by a rifle. Buckley's explanation of the action of formaldehyd on the dentinal fibrillæ is, in the main, correct. He says—"It is an absolute specific for hypersensitive dentin, for it will never fail to desensitize the area of dentin immediately beneath the point of application, and it will do so without causing the tooth to ache, to any appreciable extent at least, and without injuring the pulp of the tooth. . . . The vitality of the fibrillæ is destroyed in the area affected, but the remedy will not affect sound dentin to any dangerous depth." The writer [Prinz] challenges the last part of both statements. Upon these statements hinges the sole and only question under consideration—*i.e.* Does Buckley's paste contain an agent which eventually will kill the pulp, or not? The writer [Prinz] most emphatically denies the self-limiting action of formaldehyd gas. (See below.) It is but common sense to realize that the vascularity of the dentin of each individual, too, offers varied degrees of resistance to the penetration of formaldehyd gas. The enormous penetrating power of formaldehyd gas as liberated from trioxymethylene sealed in a tooth is readily demonstrated by the fact that it will pass through a well-set cement filling whose edges have been sealed

with paraffin. By the morphin-sulfuric acid test (see below) the presence of the gas outside of the filling may be demonstrated. Upon living tissue formaldehyd gas acts much like arsenic, as has been pointed out by Walkhoff, but it is less reliable as far as rapidity is concerned.

Relative to the action of formaldehyd gas, Buckley states as follows: "In the preparation of the cavity, in the average case, the dentin affected by the remedy is practically all removed. If it is not, I know from my experience with the paste that the vitality of the fibers is subsequently restored, for after a few weeks sensation returns. While this regeneration of the fibrillæ is being brought about, the tooth may develop slight thermal sensitiveness, which lasts for about a week." To comprehend the action of the only active constituent of Buckley's paste, *i.e.* formaldehyd gas, it is essential to have a clear conception of its pharmacologic virtues. Formaldehyd is a protoplasm poison and a caustic, *i.e.* it combines chemically with albumin, forming a new compound known as protagen; thrombosis of the capillaries results, which is followed by stasis of the circulation, and, consequently, death of the involved tissues. The chemic change of albumin into protagen renders the former immune to the attacks of ferments. As the autolytic decomposition of pulp tissue primarily depends upon the action of ferments liberated from leucocytes, we may understand why a pulp killed by and impregnated with formaldehyd offers a prolonged resistance to the action of autolytic ferments and bacteria, or, in other words, a tooth carrying a pulp killed by formaldehyd may appear normal for many weeks or even months before the death of its pulp is manifest.

Dr. Buckley's statement relative to the "regeneration of fibrillæ" is contrary to accepted views in pathology. As we have stated above, the action of formaldehyd gas depends upon its chemic combination with the albumin of the living tissue, *i.e.* it kills the tissue. To assume that dead tissue regenerates itself is an assumption which does not merit discussion. While the action of absorbed formaldehyd gas is unlimited and persistent, nevertheless it is frequently very slow; hence a pulp may react to heat and cold for weeks or even months before it finally succumbs.

EXPERIMENTAL WORK.

To ascertain the therapeutic action of Buckley's paste, various tests were made on living teeth in the mouths of patients. These teeth were doomed to extraction for various reasons by the prosthetic department of our institution.

While carrying on some experimental work relative to "vital" staining, the writer observed that methylene blue when placed in the cavity of a tooth with a living pulp will stain decalcified dentin only, while sound dentin will not take the stain at all. If, however, an agent which devitalizes the dental fibrillæ, *i.e.* arsenic or formaldehyd, is added to the methylene blue, the stain is carried along the track of the devitalized area into the pulp. The pulp will become stained step by step with the advance of the devitalizing agent into the deeper structure.

Case 1. In the mouth of a woman of about forty-five years, three upper bicuspids were selected for experimental work. In an existing cavity of one tooth a small amount of Buckley's paste, mixed with the methylene blue, was sealed-in with temporary stopping; into a sound upper bicuspid a small cavity was drilled just beyond the dento-enamel junction. This tooth was treated with a paste having the following composition:

Trioxymethylene,	20 gr.
Vaselin,	40 "
Methylene blue, q. s. to color.	

The third tooth was prepared in the same way, and received a treatment consisting of a paste of the following composition:

Cocain hydrochlorid,	3 gr.
Thymol,	3½ "
Vaselin,	54 "
Methylene blue, q. s. to color.	

After forty-eight hours all three teeth were extracted and ground sections were prepared at once. Results: The first tooth showed a

distinct blue stain in the form of a strip reaching from the cavity wall to the pulp chamber. The entire pulp was stained greenish blue to the very apex. The second tooth showed exactly the same picture. The third tooth showed no trace of stain whatever.

The experiment proves (1) that formaldehyd is the agent which penetrates through the entire mass of dentin into the pulp, and (2) that cocain and thymol have no penetrating power, and consequently no action upon sound dentin within twenty-four hours.

To ascertain the presence of formaldehyd gas, first in the paste, second in the hard tooth structure, and third in the pulp, the following test was applied: A few crystals of morphin sulfate are dissolved in a few drops of concentrated sulfuric acid. If formaldehyd, even in minute traces, is brought into contact with this freshly prepared solution, a Bordeaux red color is produced at once. The presence of formaldehyd was demonstrated in the three specimens, *i.e.* the paste, the dentin, and the pulp.

Case 2. An upper right molar in a woman about forty years of age, having a large cavity, was prepared in the infirmary for the reception of the routine arsenical fiber for the purpose of devitalization. The electric current revealed a sound pulp. The pulp was not exposed, but covered with a layer of sound dentin. Instead of the arsenical fiber, Buckley's paste was sealed into the cavity. The amount used was equal to the arsenical fiber as usually employed for such purposes. Within forty-eight hours the pulp chamber was opened into, the pulp of the palatine root was removed with practically no pain to the patient, while the pulp stumps in the buccal canals were too sensitive to be removed. The treatment was renewed. Within forty-eight hours both pulp stumps were removed by a student with practically no pain to the patient.

Parenthetically it may be remarked that the student did not know the nature of the compound employed for this purpose. The presence of formaldehyd was revealed as stated above. Results: Buckley's paste had devitalized the pulp exactly in the same manner as we clinically observe it with arsenic.

Case 3. In an upper left bicuspid, having a deep cavity, Buckley's paste was sealed for one week. After the return of the patient the pulp was found to be still very sensitive to the touch of an instrument when pressure was exerted. Arsenical fiber was placed into the cavity for one week. On return of patient, condition was found to be the same. Pressure anesthesia was now applied. After prolonged application of cocain pressure the pulp was finally removed with practically no pain.

In this case the unreliable action of formaldehyd was clearly demonstrated. The bulbous part of the pulp must have been devitalized by the formalin, otherwise the arsenic which, contrary to formaldehyd, acts on living tissue only, would have devitalized the pulp within a week's time, or at least would have shown some action. Six more cases were experimented upon; the results merely duplicated the recorded findings.

Further experimental work has been suspended. The final dictum relative to the therapeutic value of a given drug or drug combination for a specific pathologic condition rests on clinical evidence. Reports of deaths of pulps resulting from the application of the Buckley desensitizing paste, as made by practitioners, are multiplying in such rapid succession that it is unnecessary to increase their number by laborious experiments.

In his discussion of the virtues of the Buckley desensitizing paste the writer has confined himself solely to the facts in the case as pertaining to the pharmacology of this compound.

RÉSUMÉ.

(1) Formaldehyd gas as liberated from trioxymethylene present in the Buckley paste is the *only* active constituent of this compound when applied in the usual routine quantities.

(2) Formaldehyd gas as liberated from the Buckley paste is absolutely non-self-limiting.

(3) In the routine application of the Buckley paste for the purpose in view, there is always danger of injuring the pulp.

(4) The severity of the danger increases proportionately with the penetration of the liberated formaldehyd gas.

(5) Formaldehyd gas kills living tissue.

(6) Experimental work and increasing reports of deaths of pulps from the application of the Buckley desensitizing paste as made by practitioners, proclaim this agent unsafe.*

* See Dr. A. R. Starr's letter, DENTAL COSMOS, May 1915, p. 544; also, "A Warning Against the Indiscriminate Use of Formaldehyd Preparations," by Carl J. Grove, *ibid.*, May 1913, p. 147; also, several verbal reports made by members before the Susquehanna Dental Association meeting, where this paper in substance was presented in discussion of Dr. C. S. Van Horn's paper on "Buckley's Paste as a Desensitizing Agent."

THE SECURING AND MAINTAINING OF ASEPSIS DURING CANAL OPERATIONS.

By ALFRED P. LEE, D.D.S., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, at its monthly meeting, April 27, 1915.)

IT is not my purpose in the short time at my disposal even briefly to touch upon the important subject of general asepsis in dental operations. Neither shall I introduce, to any extent, the question of drugs for the purpose of canal sterilization. Rather, I present for your consideration a canal instrument technique that to me has proved *almost* wholly satisfactory for several years—in other words, show the instruments, and the methods of handling them, used in my daily work.

I present this matter tonight not without a certain selfish interest, for I realize that the chain contains certain weak links, and if a discussion shall serve to strengthen these defective points, I shall thus be able to make my own work that much more effective.

PREPARATION OF OPERATOR'S HANDS.

As in all surgical operations, asepsis in canal work should be prefaced, first, by preparation of the operator's own hands; and second, by sterilization of the field of operation. The first of these is by no means easily or satisfactorily accomplished. Dr. A. E. Webster of Toronto, Canada, in Johnson's "Textbook of Operative Dentistry," considers this subject very thoroughly. He says, "The operator's hands are almost impossible of disinfection, because though the surface may be sterile for a while, it soon becomes infected from the natural exudations from the deeper parts of the skin."

After giving various directions for preparing the hands, and citing the numerous ways in which they are likely to become reinfected within a few minutes, Dr. Webster concludes by saying that "If absolute asepsis is demanded, rubber gloves should be worn." To the writer this procedure seems impracticable, at least at the present time. In this day of strict sanitary observance, however, it is believed that all operators with their patients', and consequently their own, welfare at heart, use every available precaution in the preparation of their hands, so that a further discussion of this phase of the subject here would seem unnecessary.

Absolute surgical cleanliness of the hands being next to impossible, then, a technique must be employed whereby *no instrument or material used in a*

root-canal may come in contact with the hands nor with any other foreign body, unless the same shall have been rendered aseptic.

STERILIZATION OF FIELD OF OPERATION.

Sterilization of the field of operation is much nearer possible. My own method consists of first a thorough high-pressure spraying of all parts of the mouth to remove remaining food particles. The teeth to be isolated are then, if the case seem to demand it, cleaned by scaling, and polished by brush and pumice. Following the adjustment of the dam, these teeth are sopped with a full-strength solution of phenol, the excess wiped off, then flooded with alcohol, and dried by blasts of warm air. If the tooth to be opened has a cavity of decay, the same sterilizing process is carried out after all carious material is removed, and just preceding canal instrumentation.

CLASSIFICATION OF ROOT-CANAL INSTRUMENTS.

In further allusions to instruments used in canal work—and there are but five main varieties of such—I shall use a definite classification. There may be other terms applied to some of them, but none, I think, so applicable. I name them in the order in which they are generally used, and only give this nomenclature for the reason that the term broach seems by many to be applied to anything that may be used in a canal. At the risk of appearing pedantic, then, I submit the following terms, with their definitions:

(1) A *bristle,* which is essentially an exploring instrument, and presents rounded sides, an extremely fine point, and is made of spring-tempered steel.

(2) *Pulp extractors,* usually designated canal cleansers. These are simply spring-tempered bristles on whose sides barbs have been produced.

(3) *Canal reamers and drills.* These also are of spring temper, usually shorter and thicker than either of the foregoing instruments, and have spiral grooves running from point to base.

(4) *Broaches.* These were originally used solely by the watchmaker, and consist of delicately pointed instruments containing five or six sides. The watchmaker uses them highly tempered, for reaming purposes, but for tooth-canal work they should have the temper drawn. Their sole use is the carrying of cotton fibers for drying or medication purposes. Barbed broaches, usually called Swiss broaches, were at one time much in vogue, but today possess no place in the dental armamentarium.

(5) *Canal pluggers.* These are fully described by the title, and the particular ones used by myself will be shown later.

As stated, the only reason for giving this classification is because there seems to be a general mix-up in terms. At least half of the manufacturers of dental instruments designate a pulp extractor—which name, to my mind, exactly expresses its purpose—as a nerve broach, and unfortunately many dentists are guided by and adopt such misnomers.

STERILIZATION OF ROOT-CANAL INSTRUMENTS.

The pulp extractors I employ are fitted into slender aluminum handles. Before using they are boiled and placed in test tubes containing a 50 per cent. alcoholic solution of lysol. All bristles, reamers, and drills are also boiled, and kept in suitable containers in a like solution. Broaches and canal pluggers, however, are boiled, dried, and placed in the cabinet, for these may be sterilized without injury by passing them through a Bunsen flame immediately preceding their insertion in a canal. Such a treatment would be ideal in the case of all canal instruments, for everyone recognizes that the drawers of a dental cabinet are far from aseptic. But highly-tempered instruments, of course, such as bristles, pulp extractors, reamers, and drills, would immediately be ruined by coming in contact with a flame.

METHOD OF KEEPING TREATED ROOT-CANALS STERILE.

The question of hermetically sealing a tooth once treated, so that it may re-

sist ingress of foreign materials and yet admit of easy access for further treatment without the possibility of reinfection, is one to which not enough attention has been given in the past. My own method is as follows, and inasmuch as the whole technique shortens rather than lengthens the time required for a treatment, I believe it to be worth your consideration:

Having applied my canal dressings, the coronal portion of the pulp chamber is dried of medicaments, the sides thereof moistened with eucalyptol, and it is filled with temporary stopping—the pulp chamber only, mark you. The cavity, including the missing wall of enamel, is now filled with temporary cement, using a matrix if deemed necessary. At subsequent sittings it is only necessary to adjust the dam over the single affected tooth, then remove the occlusal portion of the temporary cement, in order to reach the temporary stopping in the pulp chamber, that portion of the cement representing the missing enamel wall being allowed to remain until the canals are filled and all possibility of reinfection is past.

PREPARATION AND MANIPULATION OF ROOT-CANAL INSTRUMENTS.

A word here regarding the preparation and handling of some of the instruments. I spoke of using canal cleansers or pulp extractors fitted into aluminum handles. This material is employed, of course, because of its light weight, allowing a more delicate sense of touch than is obtained when the instrument point is fitted into a heavy handle. The point may be readily taken out and a new one inserted. All instruments are removed from the tubes or other containers by means of pliers, and placed on the bracket table so that nothing may come in contact with the points. To facilitate the work of the assistant, the tubes are marked by grooving bands upon them at a point near the top. I have been asked if I ever use a pulp extractor the second time, or rather on a second case. These may be so efficiently sterilized that I have no hesitancy in using them over and over, but as sharp barbs are necessary in pulp extraction and the cleaning and sterilizing process usually injures these, I use a second-hand extractor only for removing cotton dressings.

The canal pluggers I show are made from steel crochet needles, and answer the purpose better than anything I have been able to purchase ready-made.

PRESERVATION OF GUTTA-PERCHA POINTS.

The gutta-percha points, you will observe, are kept in an air-tight vessel containing alcohol. Those shown have had about 2 mm. removed from their points, as these extremely fine points only crumple up when placed in canals. They are taken from their receptacle by means of sterilized pliers, dried of the alcohol—with cold air—and attached at the base to a canal plugger, slightly warmed.

STERILIZATION AND MANIPULATION OF COTTON.

But the weak link in the chain is the absorbent cotton used in drying out canals and conveying medicaments, and the manipulation thereof. Fortunate is it for us that we can use more powerful and diffusible drugs than may be used by the general surgeon, else all our careful work would in most cases go for naught.

In the first place, it is next to impossible to have our cotton sterile, or having it so, to retain it in this condition for any great length of time. Very few, if any, dental offices are equipped with autoclaves such as hospitals use for the sterilization of cotton and gauze. And assuming that we were given sterile cotton, how else may it be applied to a broach other than by the hands, which, as has been shown, are almost impossible of sterilization, save for a few minutes at a time. The late Dr. W. D. Miller recognized this weak point in our technique, and suggested that the cotton be placed on the broaches, in considerable number, and the whole then subjected

to a sterilizing process. In some cases where this method was tried out the delicate instruments were found to have become brittle, and as a practicable method the plan met with little favor.

At a dental convention several years ago I witnessed a demonstration of a small motor with a chuck readily admitting a broach handle. The operator fed to the broach contained therein fine fibers of cotton, which were wound very beautifully from the point of the broach to any portion of the shank of the instrument desired by the operator. The demonstrator's claim was a saving of time, but I was unable to see where his method was more rapid than the old-fashioned way of applying the cotton by one's fingers. But it surely had something in its favor in the way of cleanliness, if not absolute asepsis, and it has seemed to me that given a small autoclave, by which our cotton may be rendered aseptic, and the hands of one's assistant, which may be sterilized just before the winding process is begun, a technique might be evolved whereby our canal operations may be just as positive, as regards the prevention of asepsis, as is the technique of the operating surgeon. During the coming year I hope to develop and at least give a trial to a plan such as suggested.

I submit the question at this point to my hearers, and hope for assistance in the clearing up or removing of the weak point in what I believe to be an otherwise rational technique.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

NORMAL OCCLUSION THE BASIS OF THE PRACTICE OF DENTISTRY:

BEING THE

Report of the Correspondent, New York State Dental Society.

By L. M. WAUGH, D.D.S., New York, N. Y.

(Read before the Dental Society of the State of New York, at its annual meeting, at Albany, May 13, 1915.)

YOUR Correspondent assumes the duties of his office with the understanding that it is his privilege to make selection of a topic the consideration of which shall be of general interest to the members of the society and to the profession. In deciding upon the subject for this report, it was with the conviction that the title chosen conveys an essential fundamental fact as old as modern dentistry, and yet but little appreciated and employed by practitioners in general. Certain leaders, however, have recognized its value, and have used it in varying degree as the basis for their daily practice. With the hope of urging its importance upon the members and the profession as a whole, it was decided to obtain the opinions of dentists in widely separated sections. To this end a list was compiled consisting of names of members of the profession who had shown interest in advanced methods of practice, together with instructors in the colleges constituting the membership of the American Institute of Dental Teachers in the departments of operative dentistry, prosthetic dentistry, crown and bridge work, oral and special pathology, and orthodontia, and the following letter and list of questions was sent to 260 practitioners:

My dear Doctor,—You have been selected by the Correspondent of the Dental Society of the State of New York as one of the leading minds from whom it is desirable to obtain an expression of opinion on certain questions of an eminently practical nature. It is not the aim, at this time, to solve intricate problems, but simply to impress upon dental practitioners the fact that "Normal occlusion is the basis of the practice of dentistry," and to offer some suggestions that shall serve as a means by which anatomic occlusion may be produced in everyday practice.

The questions may seem very simple, but from dental literature, and especially from opinions expressed in discussion, there is proof that there are still many who have not recognized it as the basis for all dental practice. Therefore your answers, tabulated with those of others, will greatly aid the Correspondent in his humble effort.

Rest assured of the appreciation of the society and the personal gratitude of the Correspondent.

Gratefully yours.

L. M. Waugh, *Correspondent.*

QUESTIONS.

(1) Do you recognize normal occlusion as the basis of all branches of dental practice?

(2) Do you consider the full complement of natural teeth or their anatomic duplicates as essential to normal occlusion?

(3) Do you consider the making of "study models" for diagnosis and outlining of treatment as being essential to the most efficient dentistry?

(4) What percentage of so-called pyorrhea do you consider to have had its inception in malocclusion? [This implies also defective approximal contacts.]

(5) Do you recognize a gradual retrogressive change as taking place in the relations of the teeth and arches when in malocclusion?

(6) Do you consider this change to reach the minimum in proportion as the occlusion approaches normal?

(7) Do you believe it best to zealously conserve the third molars that have erupted and taken practically normal positions?

(8) Give briefly your reasons for your answer to No. 7.

(9) In cases where teeth have been extracted and the adjoining teeth have partly closed-in the space, do you consider it best "as a principle" to move the adjoining teeth into their normal positions before placing an artificial substitute?

(10) If not, why?

(11) What means do you employ for producing anatomic occlusion in small areas, as in a single crown and in bridge work?

(12) In making full dentures, do you consider the establishment of the correct position of the models to the point of motion in the articulator as essential to most efficient results?

(13) Do you regard the use of the face-bow or some one of its modifications as essential to this?

(14) Do you consider the reproduction of the marginal, triangular, and oblique ridges, together with well-defined angular grooves and sulci, as an essential factor in restoring efficient occlusion?

(15) Do you consider that in the restoration of lost occlusal areas an accurate anatomic counterpart is necessary to the retention of teeth that have been moved into normal occlusion?

Replies were received from 141 dentists, practicing in twenty-two states and in four provinces of Canada. Answers were sent in by 100 teachers in forty-one of the forty-seven colleges comprising the most recently published membership of the Institute. Therefore the report includes opinions of teachers in all but eight of these dental schools, and in addition that of 41 practitioners who are not associated with dental faculties. It would seem that this should serve as quite a representative expression.

The answers were carefully tabulated and constitute the summary of this report. From this and the goodly number of detailed answers that were given, the list of conclusions was drawn. It has been the constant aim of your Correspondent to base this report wholly upon the opinions expressed in the replies. and while it is obvious that the author of the list of questions is in sympathy with them, it was his constant endeavor in recording the answers to quote both negative and affirmative comments, and to eliminate all personal bias. Therefore it is expected that this report will be accepted as a compilation of the expressed opinions of dental teachers in nearly all the colleges and practitioners in most parts of the United States and eastern Canada.

SUMMARY OF ANSWERS, WITH CONCLUSIONS.

QUESTION 1—*Do you recognize normal occlusion as the basis of all branches of dental practice?*

"Yes," answered by 112. "No," by 3. "Yes, with minor exceptions," by 4. "Yes, of operative and prosthetic dentistry," by 4. Unanswered by 18.

(Quotations from answers.)

N. S. Hoff: "Fundamentally essential, more so than any other."

S. H. Guilford: "By no means, but it is important in all."

C. N. Johnson: "Normal occlusion is a fundamental requisite."

H. L. Wheeler: "Desirable, but not always necessary for efficiency."

W. B. Dunning: "As an ideal basis, not always attainable."

M. L. Rhein: "All branches that concern occlusion, but there are many that do not come under this head, therefore I think the question should be modified."

H. E. S. Chayes: "Normal occlusion, as usually understood, is but one of the essentials which we must work for. The basis of all dentistry is, in my opinion, a macroscopy of the maxillary apparatus which would in all essentials be acceptable to the human organism. This means much more than normal occlusion."

Conclusion (drawn from total of answers). Normal occlusion is the basis of the practice of dentistry.

QUESTION 2—*Do you consider the full complement of natural teeth or their anatomic duplicates as essential to normal occlusion?*

"Yes," answered by 120. "No," by 9. "Yes, third molars excepted," by 9. Unanswered by 3.

(Quotation from answers.)

N. S. Hoff: "Assuredly, almost as essential as every cog in the wheels of a watch."

Conclusion. The full complement of natural teeth or their anatomic duplicates is essential to normal occlusion.

QUESTION 3—*Do you consider the making of "study models" for diagnosis and outlining of treatment as being essential to the most efficient dentistry?*

"Yes," answered by 100. "No," by 3. "Not in pathologic work," by 2. "In most cases,. yes," by 6. "When restoring occlusion," by 9. "Very helpful, but not always necessary," by 14. Unanswered by 7.

(Quotations from answers.)

N. S. Hoff: "No diagnosis is complete without accurately made articulated models."

E. H. Smith: "Yes, and have so practiced."

F. B. Moorehead: "Yes, with reasonable limitations."

S. E. Davenport: "Yes, an excellent plan, and one I have used in important cases for many years."

H. M. Semans: "Yes, have been doing so for some time."

W. C. Deane: "Emphatically, yes."

E. G. Parker: "Yes, by far the safest and most accurate results are obtained by so doing."

C. Barton Addie: "Imperative."

L. Meisburger: "Study models are absolutely necessary in studying case in hand and determining treatment to be undertaken. It makes for intelligent as well as efficient dentistry."

S. W. Bowles: "Yes, decidedly."

E. A. Bogue: "Have so considered it for twenty-five or thirty years."

R. G. Hutchinson, Jr.: "It is unnecessary, in my opinion, to make study models for diagnosis and outline of treatment in connection with pathological conditions having their origin in malocclusion. It would be most desirable to do so, however, when demonstrating, or teaching those who are inexperienced."

H. E. Kelsey: "Models of any patient who remains in the hands of the same operator are instructive from the beginning, and later become almost invaluable."

Conclusion. Study models are essential to most efficient dentistry—(*a*) when considerable areas of occlusion have to be restored; (*b*) when malposed teeth have to be moved into normal position; (*c*) models for study and record should invariably be made when there is the least doubt as to the proper procedure.

QUESTION 4—*What percentage of so-called pyorrhea do you consider to have had its inception in malocclusion (this implies also defective approximal contacts)?*

Percentages.			
100% ans. by	2	60% ans. by	2
95 " " "	2	50 " " "	15
90 " " "	6	30 " " "	2
80 " " "	2	25 " " "	7
75 " " "	8	20 " " "	3
70 " " "	2	10 " " "	5

	Answered by	Percentage for estimate.
"Large majority,"	6	75
"Majority,"	3	60
"Large percentage,"	16	50
"Important factor,"	6	50
"Small percentage,"	6	10
"Not a factor,"	3	

On this basis—"70 per cent. and more," answered by 31; "50 to 70 per cent.," by 42; "30 per cent. or less," by 23.

(Quotations from answers.)

Mallory Catlett: "I am confining my work almost exclusively to oral prophylaxis and pyorrhea, and in the past eight years have had very few cases come under my observation without malocclusion being associated. It is so almost invariably the case that the exception is seen very seldom. I am saying 90 per cent. in my answer to question 4, but I firmly believe that a greater percentage have their inception in malocclusion."

E. A. Bogue: "The bulk of all that occurs among young or middle-aged persons."

J. W. Beach: "I have said in my answer to number 4 that at least 50 per cent. of pyorrhea and contributing conditions are due to malocclusion. My personal conviction is that 85 per cent. comes nearer to a correct statement. I believe that you will agree with me that we can do very much toward a cure of pyorrhea with a merry little grindstone."

H. M. Semans: "Very high; can't conceive of so-called pyorrhea in normal mouths if proper chewing is done."

R. G. Hutchinson, Jr.: "It is impossible for me to state exactly what percentage of so-called pyorrhea I believe has its inception in malocclusion, as I have not tabulated my cases on that point, but I will say that I have rarely seen a case of pyorrhea in which malocclusion is not the most important factor. Nearly all infections of the oral tissues are dependent for their existence on trauma, and I believe in the vast majority of cases trauma will be found to be caused by malocclusion, especially when a very deep pocket exists or the tooth is perceptibly loose."

Conclusion. Malocclusion is the most important causative factor in so-called pyorrhea, and conversely, pyorrhea seldom is to be found when the teeth are in normal occlusion and in proper use.

QUESTION 5—*Do you recognize a gradual retrogressive change as taking place in the relations of the teeth and arches when in malocclusion?*

"Yes," answered by 114. "No," not answered by anyone. "Large percentage, but not all cases," answered by 17. Unanswered by 10.

Conclusion. A gradual retrogressive change is taking place in the teeth and arches when in malocclusion. The rapidity and degree of this change will vary greatly in different individuals according to histologic constituents, but it always takes place in some degree.

QUESTION 6—*Do you consider this change to reach the minimum in proportion as the occlusion approaches normal?*

"Yes," answered by 120. "No," by 3. "Possibly," by 3. Unanswered by 15.

(Quotations from answers.)

G. W. Dittmar: "Yes, if tonsil and nasal conditions do not interfere."

G. S. Butler: "When occlusal planes are in normal relations there should be no change."

Conclusions. (*a*) The retrogressive change which takes place in the relations of the teeth and arches reaches the minimum in proportion as the occlusion approaches normal. (*b*) When the teeth are in normal occlusion there should be no change other than that which is inevitable and is expressed in the term "old-age tendency of the human body," except in rare cases of grave constitutional origin.

QUESTION 7—*Do you believe it best to zealously conserve the third molars that have erupted and taken practically normal positions?*

"Yes," answered by 88. "Yes, when in occlusion and sanitary," by 36. "Yes, except where there is pulp involvement," by 6. "Yes, except when prone to caries," by 3. "No," by 4. Unanswered by 4.

Conclusion. The third molar should

be zealously conserved when in occlusion and it may be maintained in a state of health.

QUESTION 8—*Give briefly your reasons for your answer to No. 7.*

"Greater masticating surface and crushing force," answered by 57. "For the purpose of maintaining tight contacts," by 27. "May be needed as abutments later," by 12. "To preserve the maxillary tuberosity and contour of face," by 6. Reasons not given by 39.

(Quotations from answers.)

C. N. Johnson: "Anything that will tend to 'loosen up' the contacts will lessen the integrity of the arches."

E. A. Bogue: "The support of third molars is greatly needed with advance of years to brace up and sustain forward teeth."

A. M. Wright: "Their presence has a tendency to elevate the arches of the throat and give better quality to the voice."

A. J. Bush: "They are the final factors in the scheme of development of the jaws and face, and are essential to the establishment and maintenance of harmony."

Ellison Hillyer: "Extraction always has a negative influence on the integrity of the arch."

M. L. Rhein: "There is more than normal position demanded to advise retention. There is not a more difficult matter to decide, as extraction is often beneficial."

D. M. Cattell: "Exceptions: Too crowded; heavy folds of mucous membrane; imperfect structure, and malposition."

H. E. S. Chayes: "(*a*) As an aid to mastication. (*b*) As an aid to circulatory re-stimulation in the mouth by virtue of tooth movement during mastication. (*c*) As a buttress of defence for the gingival tissue around the second molar, dynamically and occlusally considered. (*d*) As a matter of general principle not to disturb but rather to conserve normal relations in the oral cavity. (*e*) Never to remove anything that is good and helpful unless I can substitute something better. There are several other good reasons, but the above are sufficient."

G. H. Wilson: "For development of jaws and supports for approximal contacts."

H. E. Kelsey: "The third molar is as important in an arch in which it can erupt normally as any tooth."

Conclusions. Third molars when in normal healthy relations serve—

(*a*) For the purpose of maintaining tight approximal contacts. This becomes progressively more necessary with advance of years.

(*b*) To afford greater masticating surface in themselves and to increase the collective crushing force of the teeth.

(*c*) For abutments if needed.

(*d*) For the protection of supporting structure about the second molar.

QUESTION 9—*In cases where teeth have been extracted and the adjoining teeth have partly closed-in the space, do you consider it best "as a principle" to move the adjoining teeth into their normal positions before placing an artificial substitute?*

"Yes, as a principle," answered by 51. "Yes, as a principle with exceptions," by 58. "In youth only," by 7. "No," by 14. Unanswered by 11.

(Quotations from answers.)

E. A. Bogue: "It depends entirely upon the age of the patient. If very young, yes; if middle-aged, rarely; if old, no."

J. H. Prothero: "Yes, in practically all cases except where the regaining of the lost space would result in disturbing the established occlusion to any great extent."

J. P. Ruyl: "As a general thing, no, except in cases where the anterior teeth have been lost and the space is not wide enough to admit the same number of artificial ones. Then to get the desired artistic effect I would move the anterior ones."

G. H. Wilson: "Yes, but only in youth."

F. L. Stanton: "As a principle, yes, although there are many exceptions."

Gladstone Goode: "Yes as a principle, but unwise much beyond youth."

A. J. Bush: "Yes, during developmental period."

E. H. Smith: "Depends entirely on the age of the patient."

Conclusions. (*a*) "As a principle" governing best practice, it is imperative that, in youth, teeth that have drifted because of the loss of an adjoining tooth be moved into normal position prior to the placing of an artificial substitute. (*b*) In middle life and with advancing age, each case more and more becomes a law unto itself, but when efficient and

artistic demands dictate, it should be done, except with invalids and the aged.

QUESTION 10—*If not, why? Contra-indications.*

"Age," answered by 26. "Health," by 6. "Unadvisable in advanced age," by 5. Unanswered by 104.

(Quotations from answers.)

W. C. Deane: "My practice is in each individual case to secure a set of radiographs, study models, and a history of the case before definitely deciding upon the course of treatment."

M. L. Ward: "If the patient has passed maturity, I am emphatically against it, if the teeth are to be used for bridge abutments, either fixed or removable, in most cases, because of the difference between the result obtained by so doing and what may be done by other means will not warrant it."

G. H. Wilson: "Too much tax on the organism, and permanence too doubtful."

T. A. Trumble: "Attachment would be weakened by moving, while good articulation can be obtained in an artificial substitute."

F. A. Delabarre: "Beyond twenty-five years of age expediency governs the decision; the age, general health, time required, etc., are the determining factors."

E. A. Bogue: "If the inclining teeth were brought to an upright position they would be too long, would strike too forcibly, and would sooner be lost."

QUESTION 11—*What means do you employ for producing anatomic occlusion in small areas, as in a single crown and in bridge work?*

"For single crowns, 'squash' bite and when finished corrected in the mouth," answered by 22. "For bridge work, casts mounted on anatomic articulator," by 36. "For single crowns and bridges, the Oscillating Bite," by 9. Unanswered by 73.

(Quotation from answers.)

H. E. S. Chayes: "Occluding models of entire jaws, and finally corrected in the mouth."

Conclusion. The "Oscillating Bite" as a means of producing anatomic occlusion in limited areas, as given by the writer in a clinic before this society at the previous two meetings, has not been generally understood. Therefore, and because a description of this method has not appeared in print, the technique will be given as the concluding part of this report.

QUESTION 12—*In making full dentures, do you consider the establishment of the correct position of the models to the point of motion in the articulator as essential to most efficient results?*

"Yes," answered by 107. "No," by 5. "Means at hand is not accurate," by 1. Unanswered by 28.

(Quotations from answers.)

G. H. Wilson: "Most assuredly and unequivocally, yes."

E. E. Belford: "Most emphatically."

J. H. Prothero: "Absolutely necessary."

G. B. Snow: "Most certainly, yes. The correct position of the models in the articulator is very essential."

Ellison Hillyer: "Absolutely."

J. P. Ruyl: "It is essential in order to get a proper anatomical articulation, to place the models in a correct position in the articulator. This result can only be obtained by the condyle and lateral path register or face-bow. The finished dentures must remain stable at any and all movements of the jaw."

Conclusion. In making full dentures it is essential to the most efficient result that the correct position of the models to the point of motion be established in the antagonizor.

QUESTION 13—*Do you regard the use of the face-bow or some one of its modifications as essential to this?*

"Yes," answered by 90. "No," by 15. Unanswered by 36.

(Quotations from answers.)

H. L. Wheeler: "Yes, emphatically."

Ellison Hillyer: "Absolutely."

S. H. Guilford: "Face-bow very essential."

R. Murray: "Have had such universal success in its use that I consider it essential."

H. C. Harkrader: "I most certainly do."

G. B. Snow: "Yes. Until the face-bow was invented the matter of placing the models in the articulator was simply guesswork, and they were more likely to be wrongly placed than otherwise."

J. H. Prothero: "There are two fundamental factors of vital importance in the construction of anatomic and scientific dentures that cannot be ignored without lessening the

quality and efficiency of the substitutes. The first is mounting the casts in correct horizontal plane relationship to and radial distance from the rotation centers of the occluding frame. This is accomplished by means of the face-bow or some other similar device. The second consists in registering the pitch of the condyle paths of the patient, and setting the condyle paths of the occluding frame at corresponding pitch. This may be accomplished by two somewhat different methods. First by means of the Snow appliance and Christensen's method of condyle registration, and second by means of the more elaborate Gysi apparatus, called the 'condyle register.'"

G. H. Wilson: "Yes. The Snow face-bow is the one and only instrument of value in making measurements for mounting the case upon the antagonizor. The face-bow establishes two things—(1) the relations of the occlusal plane to the condyle, and (2) the perpendicular of the triangle. These statements will require a terse elaboration:

The mandible is a lever of the third class, and its fulcrum end is variable in form but of an irregular elongated globular shape. It is separated from the fulcrum by a cartilaginous cushion and two bursal sacs. It is incased in and attached to the glenoid fossa by a capsular ligament. Its muscular attachments have power to move it an appreciable distance in various directions—as forward, outward, inward, upward, and downward, also in the direction of the resultant of certain of these directions. Therefore it has no fixed center or axis of movement, but is a very adaptable joint. The closing movements, but not the opening movements, of the mandible are of interest to the dental scientists, and this only when two or more cusps of teeth impinge while moving into natural occlusion. Necessarily these movements are slight and inaccessible, therefore cannot be measured, but can be sufficiently accurately reproduced for any practical purpose.

It is universally recognized that the form of the mandible is based upon the triangle, that the base of the triangle is from the crest of one condyle to the crest of the other, and that the apex is the normal mesial incisal angle of the central incisor teeth, hence the perpendicular of the triangle is in the sagittal plane and is at right angles to the base-line. Therefore the working triangle is equilateral, while the anatomical triangle may be equilateral, isosceles, or scalene. The perpendicular of the triangle is easily obtained by the Snow face-bow, and is the only necessary and reliable measurement.

There are no fixed rotary centers in the temporo-mandibular joint, but in the closing movements of the mandible its gyrations are directed by the cusps and planes of the teeth, either natural or artificial. Therefore there are several rotary centers, but all outside of the joint. It has been demonstrated that in the horizontal rotary movement of the closing mandible the rotary center is in the sagittal plane, and may be upon the base-line or any distance back of it. Dr. Rupert E. Hall of Houston, Texas, has demonstrated that if the rotating center is placed at the same distance back of the base-line that the apex is in front of it, perfect working results may be obtained. Norman G. Bennett of England has demonstrated the lateral mandibular movement. As this movement is the segment of a circle with its rotating center vertical in the sagittal plane and governed entirely by the angles and planes of the teeth, it follows as a logical sequence that this rotation center may be established at the will of the operator. Whereas these two movements—horizontal and vertical—are the two movements of mastication, and as a forty-five degree angle will produce the greatest efficiency in mastication, Dr. Hall has embodied these and other valuable principles in an instrument soon to be placed upon the market, which the writer confidently believes is destined to revolutionize prosthetic dentistry."

Conclusion. The Snow face-bow or some one of its modifications is essential to the establishment of the correct position of the models to the point of motion in the antagonizor.

QUESTION 14—*Do you consider the reproduction of the marginal, triangular, and oblique ridges, together with well-defined angular grooves and sulci, as an essential factor in restoring efficient occlusion?*

"Yes," answered by 104. "Yes partly," by 9. "No," by 6. Unanswered by 22.

(Quotations from answers.)

H. E. S. Chayes: "Yes, more than that. I consider the reproduction of the marginal triangular and oblique ridges, with the perfect continuity of surface at point of apposition between natural tooth and restoration, a very great if not the greatest factor in the prevention of traumatism of the gingival tissues."

W. T. Chambers: "Marginal, triangular and oblique ridges, yes! angular grooves and sulci, no!"

W. S. Rose: "I believe it well to reproduce these anatomical features, but there is not the same fundamental necessity as for correct interproximal areas."

G. B. Snow: "The production of grooves and sulci in the grinding surface of artificial teeth to correctly meet the cusps of their opponents certainly adds very much to their efficiency in mastication, and is a matter which should never be overlooked."

Conclusion. (*a*) The reproduction of marginal, triangular, and oblique ridges *in harmony with those in the mouth,* together with properly placed contact points and well-defined angular grooves and sulci, is essential in restoring most efficient occlusion and masticating power. (*b*) In making artificial dentures the reproduction of these anatomic features is also essential to the most efficient result.

Question 15—*Do you consider that in the restoration of lost occlusal areas an accurate anatomic counterpart is necessary to the retention of teeth that have been moved into normal occlusion?*

"Yes," answered by 119. "No," by 3. Unanswered by 19.

(Quotation from answers.)

S. E. Davenport: "I consider the establishment of normal occlusion as the greatest and most needed method for the retention of teeth which have had their positions changed."

Conclusion. In restoration of lost occlusal areas an accurate anatomic counterpart is necessary to the retention of teeth that have been placed in normal occlusion.

Summary of Conclusions.

(1) Normal occlusion is the basis of the practice of dentistry.

(2) The full complement of natural teeth or their anatomic duplicates is essential to normal occlusion.

(3) Study models are essential to most efficient dentistry—(*a*) When considerable areas of occlusion have to be restored. (*b*) When malposed teeth have to be moved into normal position. (*c*) Models for study and record should invariably be made when there is the least doubt as to the proper procedure.

(4) Malocclusion is the most important causative factor in so-called pyorrhea, and conversely, pyorrhea seldom is to be found when the teeth are in normal occlusion and in proper use.

(5) A gradual retrogressive change is taking place in the teeth and arches when in malocclusion. The rapidity and degree of this change will vary greatly in different individuals according to histologic constituents, but it always takes place in some degree.

(6) The retrogressive change which takes place in the relations of the teeth and arches reaches the minimum in proportion as the occlusion approaches normal. When the teeth are in normal occlusion there should be no change other than that which is inevitable and is expressed in the term "old-age tendency of the human body," except in rare cases of grave constitutional origin.

(7) The third molar should be zealously conserved when in occlusion and it may be maintained in a state of health.

(8) Third molars when in normal healthy relations serve—

(*a*) For the purpose of maintaining tight approximal contacts. This becomes progressively more necessary with advance of years.

(*b*) To afford greater masticating surface in themselves and to increase the collective crushing force of the teeth.

(*c*) For normal development and harmonious contour of the face.

(*d*) For abutments if needed later.

(*e*) For the protection of supporting structure about the second molar.

(9) (*a*) "As a principle" governing best practice, it is imperative that, in youth, teeth that have drifted because of the loss of an adjoining tooth be moved into normal position prior to the placing of an artificial substitute. (*b*) In middle life and with advance of age, each case more and more becomes a law unto itself, but when efficient and artistic demands dictate, it should be done, except with invalids and the aged.

(11) The Oscillating Bite as a means

of producing anatomic occlusion in limited areas, as given by the writer in a clinic before this society at the previous two meetings, has not been generally understood. Therefore and because a description of this method has not appeared in print the technique will be given as the concluding part of this report.

(12) In making full dentures it is essential to the most efficient result that the correct position of the models to the point of motion be established in the antagonizor.

(13) The Snow face-bow or some one of its modifications is essential to the establishment of the correct position of the models to the point of motion in the antagonizor.

(14) (*a*) The reproduction of marginal, triangular, and oblique ridges *in harmony with those in the mouth,* together with properly placed contact points and well-defined angular grooves and sulci, is essential in restoring most efficient occlusion. (*b*) In making artificial dentures the reproduction of these anatomic features is also essential to most efficient results.

(15) In the restoration of lost occlusal areas, an accurate anatomic counterpart is necessary to the retention of teeth that have been placed in normal occlusion.

Description of the Oscillating Bite.

The Oscillating Bite provides a simple and accurate means for producing anatomic occlusion in restoring limited areas ranging from—(*a*) A large occlusal inlay by indirect method. (*b*) A single crown, either of metal or porcelain. (*c*) A bridge, either fixed or removable, which involves the restoration of a considerable area of occlusion. No special apparatus is needed. Instead of taking the customary "squash" bite, which reproduces only the occlusal ends of the opposing teeth in vertical closure, this bite is made with the jaws in movement as in mastication. Thus the opposing teeth displace the wax of the bite so as to form inclined planes that will provide not only for *contact* of the teeth, as with the usual "squash" bite, but in addition the clearance and harmony of inclined planes necessary to the normal gyrations of the teeth in mastication.

The progressive technique for taking the bite for a *bridge* will first be outlined: The abutments of the kind preferred for the case having been prepared, are temporarily fixed in the mouth. First a firm base is made upon the occlusal part of which the soft wax is later placed. Modeling compound in stick form has been found best for this. A piece somewhat longer than the space is warmed in a Bunsen flame, and when soft pressed with the thumb and fingers into the space, well over the ridge of jaw and about the abutments. It is essential that this foundation of compound fit so snugly that when trimmed and finally chilled there shall be no movement. The compound is shaped so that the opposing teeth clear nicely. (See Fig. 1.) The compound is now removed and wax melted in the flame is quickly dropped upon the occlusal part to the depth of about 3 mm. It is now replaced in the mouth and pressed firmly to position. The jaws are now closed and moved to the right and left, and protruded as in mastication, but not beyond. The jaws may be guided by noting the median line of upper and lower teeth and hav-

Fig. 1.

Shows the firm foundation of modeling compound in place in the mouth, after having been nicely fitted and trimmed so that antagonizing teeth just clear.

ing the lateral movement approximate 2 to 3 mm. or about half the width of a lower central incisor. The bite is removed, chilled, the excess wax trimmed, and the impressions of the teeth filled with soft wax, again returned to the mouth, and the same procedure repeated.

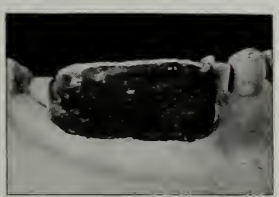
Fig. 2.

a *b*

a, Shows the oscillating bite ready for a thin coating of oil or vaselin preparatory to its replacement in the mouth for the impression.
b, Shows a bite of the same case taken in vertical closure only. (Note the difference in the extent of wax displacement.)

There must be no movement of the foundation of compound. (See Fig. 2.) It is again removed, trimmed, the surface oiled or thinly coated with vaselin, and replaced. The patient is instructed to close tightly, pressing the bite into

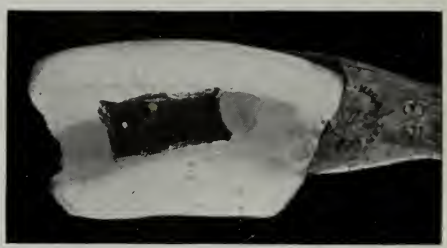
Fig. 4.



Shows the cast with bite in place, after the impression has been carefully trimmed and chipped away.

firm position while the plaster or similar material for the impression is being mixed. The bite is left in the mouth while the impression is taken, and becomes a part of it. The plaster is permitted to become somewhat resistant as it is pressed to place, so as to prevent the bite from being raised by the elasticity of the gum tissue. This is very important. The impression is removed and the abutments placed in it. (See Fig. 3.) It is varnished and the cast made. When hard, the impression material is trimmed and chipped away, leaving the cast with the abutments and bite in place on it. Care must be exercised not to mar the wax. The oil or vaselin previously applied makes separation from the bite much easier. (See Fig. 4.) This is now mounted in a crown articulator of suitable size in the usual way. A close-jointed articulator with vertical movement only is necessary. (See Fig. 5.) When the plaster is set, the bite is removed, and the case finished as desired. The occlusal surfaces of the artificial substitutes are carved or ground

Fig. 3.



Shows the impression removed with bite forming a part of it.

Fig. 5.

Shows the case mounted in a suitable articulator having vertical motion only.

as the case may require to accurately fit the inclined planes of the bite, and the angular grooves and sulci then added. The bucco-lingual measurement will correspond with that of the abutments and adjoining natural teeth.

If for a *shell crown,* the oscillating bite is taken by replacing the band in proper position, filling the occlusal end to excess with wax, and have the patient

perform lateral and protrusive movements.

If for a *large inlay* to be made by the indirect method, the cavity is filled with compound, which is carefully fitted and trimmed so that the antagonizing tooth will clear. It is removed, thoroughly chilled, the wax melted and dropped on the surface, replaced in the cavity, and the oscillating bite taken, special attention being given the contact point. It is removed and laid aside until the die is made, then placed in it and mounted. The bite is removed and casting wax is carved to the bite.

If for a *porcelain dowel crown*, either to be carved for occlusion and baked, or if a stock tooth is to be ground to occlusion and adapted to the root-end by other means, the dowel is fitted and to the root-end is adapted thin platinum—36 gage or thinner—and soldered to the dowel. This is placed on the root and a foundation of compound is fitted into the space and well over the lateral walls of the adjoining teeth. It is shaped so that the antagonizing cusps clear, is then removed, chilled, and hot wax dropped on to the occlusal part, and the oscillating bite made. This is left in place while the impression is taken, and becomes a part of it. Proceed further according to the description of completing a bridge.

If absolute anatomic occlusion is not obtained, the failure may be due—(*a*) To movement of the compound foundation in taking the bite in the wax. (*b*) To raising of the bite when taking the impression. (*c*) To failure to nicely carve or grind the occlusal area.

Having succeeded in these essentials, an absolute anatomic restoration must be produced.

[The report also embraces a LIST OF CONTRIBUTORS, with a list of the states from which replies were received, also of the colleges represented by replies coming from dental instructors.]

Your Correspondent desires, in the name of the society, to express gratitude to all who so kindly contributed to the report, and to warmly acknowledge assistance from Dr. Frank A. Gough and Dr. Geo. H. Wilson.

Respectfully submitted,

L. M. WAUGH, *Correspondent.*

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

NOTES ON CURRENT DENTAL PRACTICE:

BEING THE

Report of the Committee on Practice, Dental Society of the State of New York.

By D. H. SQUIRE, D.D.S., Buffalo, N. Y.,
CHAIRMAN OF THE COMMITTEE.

(Presented at the annual meeting of the Dental Society of the State of New York, at Albany, May 13, 1915.)

IN presenting this report, the committee feels that it is desirable to bring before your honorable body the most important phases of the present-day methods of dental practice. It will of necessity, therefore, deal with improved technique rather than with much new material.

PROSTHODONTIA.

In this department there are some items which are worthy of our consideration: (*a*) Neilson Impression Plaster. (*b*) Spence's Plaster. (*c*) Method of counteracting the contraction of rubber during vulcanization. (*d*) Protesyn Ce-

ment. (*e*) Attachments for retaining partial dentures.

Neilson's plaster material is especially desirable for difficult impressions, as well as all cases, because it is easily separated from the cast by immersion in boiling water.

There is a growing interest in the use of Spence's plaster for making the cast, as it sets very hard and shows practically zero in expansion, contraction, and compressibility. Its strength is four times greater than that of ordinary plaster of Paris, which is very desirable for general work.

In controlling the contraction of rubber during vulcanization, much may be accomplished by the use of Spence's plaster in the making of the cast, as well as in exercising care that no more rubber is packed into the flask than is absolutely needed for the plate. No excess should be allowed to remain, and it should be entirely removed after a most thorough boiling-down of the flask.

During the past year a substitute for continuous gum has been placed upon the market under the name of Protesyn cement. This material may be used upon either a gold or rubber base. If gold is used for the foundation, the teeth should be attached to the plate with a small amount of solder, leaving spaces between them, so that the cement may be packed from the labial to the lingual part of the denture. A triangular wire should also be carried around the rim of the plate from molar to molar, and then about half an inch back of the lingual surfaces of all of the teeth, joining the outer rim in the molar region. This gives additional anchorage for the cement, and a suitable margin for finishing.

The mixing of this cement is of the greatest importance, and the directions should be carefully followed. It is mixed to the consistence of dough, carried upon the spatula into all of the undercuts, and further condensed with the fingers and covered with a paraffin preparation. Then with an artist's brush No. 50, the anatomic features of the soft tissues are reproduced before the cement is set.

If rubber is used as a base, an allowance is made when waxing-up for the cement, and after vulcanization the borderlines of the rubber are made true, and sufficient anchorage is cut in the base for the retention of the cement. It should be allowed at least twelve hours in which to crystallize before being placed in the mouth. If this cement is used, the plate should be kept in water whenever it is removed from the mouth, because it cracks and bleaches if it is allowed to become dry. It is a beautiful reproduction of gum tissue and is a valuable addition to prosthodontia.

There are several important points in regard to the retention of partial dentures which have been developed and introduced by Dr. Chayes that are worthy of special mention, among them being (*a*) the coating of the model with equal parts of castor-oil and glycerin to prevent the wax from sticking; (*b*) adaptation of Solbrig's wax to the model by means of a pad of cotton dipped in warm water; (*c*) the attachment of the screw to the wax while it is still on the model; (*d*) the cutting of deep grooves on the buccal and lingual sides of the model and the pouring of the investment over the wax and into the grooves, which prevents distortion of the wax during the crystallization of the investment; (*e*) in extending the saddles in the form of a wing beyond the abutment teeth, so that a great proportion of the strain will be borne by the alveolar process instead of the root alone; (*f*) in broad saddles, the removal of a disk of wax along the lingual portion and the placing of one of larger diameter over the opening and fastened without pressing it against the cast. In the finished plate or bridge, this chamber allows for the displacement of the soft tissues, and promotes a pumping action which will prevent the blood from becoming stagnant beneath the saddle; (*g*) in adapting the saddle to the abutment teeth the gold is cut away so that it does not impinge upon the soft tissues in the gingival region.

The attachments which Dr. Chayes has developed are mechanically perfect, and by the use of the parallelometer and the parallelodrill removable bridge work may be accurately placed in the mouth without causing undue strain upon the teeth to which they are attached. This fact is of the utmost importance in point of service of this class of substitutes.

OPERATIVE DENTISTRY.

(1) *Amalgam filling.* The manipulation of this material has undergone some radical changes. It has been proved beyond a doubt that most excellent and serviceable restorations of crowns of teeth may be made in amalgam and by the Crandall method. The features of this system are (*a*) cavity preparation, (*b*) formation of the matrix, (*c*) instruments designed for condensation, and (*d*) the application of force. The anchorage for the retention of the filling is obtained in the pulp chamber, the filling being firmly seated against the subpulpal wall, and further strengthened by the surrounding vertical walls of this portion of the tooth. The matrix is made out of thin copper plate, and after being cut to conform to the line of the septal tissues and to the size of the crown, holes are punched at the points of contact on the approximal portions and enlarged sufficiently so that the amalgam when introduced into the matrix will be forced against the surfaces of the approximating teeth, and will remain in direct contact with the tooth structure. The band is also slit from its gingival border to these holes on the approximal surface, so that in removing the matrix band the amalgam is not disturbed at the contact point. These matrices are tied about the tooth with the ligature. The instruments are designed to enable the operator to condense a much greater area of amalgam at a time, and in many instances cover the whole occlusal surface. The application of force is by means of the hand mallet, which drives the particles of the amalgam very closely together, producing greater density and thereby rendering the material capable of standing the stress of mastication.

(2) *Radiography.* This apparatus is proving its worth as a means of diagnosing dental lesions. However, if we are to obtain its greatest efficiency in recording the accuracy of the fillings in root-canals, for instance, it is obvious to all who have made even a superficial study of these cases that a change should be made in our present materials and methods of technique; that is, (*a*) better access should be gained to root-canals, enabling a more thorough reaming, and (*b*) a filling material of higher refractive index.

(*a*) There is not sufficient stress laid upon the mechanical cleansing of root-canals. This statement should be followed by a distinction being made between tortuous and straight ones. In the former it is useless to argue that these canals must be made accessible to their very apices. While all available means should be employed to thoroughly ream such canals, it is impossible to always accomplish even fair results, and in cases of failure, other methods should be adopted to maintain asepsis. In a paper recently presented by Dr. C. N. Johnson he said that, under such unfavorable conditions as classed under the latter division, tortuous buccal and mesial canals of upper and lower molars could be best treated by filling them with a paste made of oxid of zinc and formocresol, this material to be carefully introduced as far as possible into the canals. He felt that this method was preferable to that of a partial filling with other materials, on account of the powerful antiseptic qualities of the formocresol. I hesitate to quote Dr. Johnson in this, for fear that someone will not put the correct interpretation upon what he means by tortuous and partly inaccessible root-canals. All normal canals should be thoroughly reamed not only to remove by mechanical means the infected dentin, but to so enlarge them that their apices may be stopped with greater accuracy.

(*b*) The employment of euca-percha compound in the filling of root-canals—

as a lubricant or a sealing, does not meet the requirement from every viewpoint. The most serious objection to its use is its low refractive index to the X-ray. In many buccal and mesial roots of upper and lower teeth and the bifurcated roots of bicuspids, we have to rely solely upon euca-percha compound, because of one's inability to place a gutta-percha cone at their apices. Many radiographs show absolutely nothing in these canals beyond the gutta-percha cone, when from an operative sense the apices have been perfectly sealed with euca-percha compound; therefore, some ingredient should be added to euca-percha to increase its refraction. It must be quite apparent to us all that the radiograph is showing many foci of infection which we thought were properly cared for by our treatment and filling of root-canals.

PYORRHEA ALVEOLARIS.

There has been much investigation during the past year in regard to the cause of this disease. In reviewing the literature which has appeared in the medical and dental journals, it is stated that more than half of all the teeth which are lost are the direct result of the ravages of pyorrhea. Bass and Johns claim that the endamœbæ, chiefly of the species E. buccalis, are found in all pyorrhea lesions, and are absent under normal conditions; again, that the endamœbæ develop and live in the dying tissues at the very bottom of the pocket. Therefore material for examination is best obtained with a No. 22 Younger scaler or a spoon excavator from scrapings at the very base of the lesion.

The treatment which is recommended is ipecac and its alkaloids, emetin and cephalin. In experiments with emetin by Bass and Johns, it was administered by hypodermic injections and later by mouth with a view of having a sufficient amount concentrated in the body to kill the endamœbæ within the pyorrhea pockets. Smith and Barrett have employed the same endamœbicide locally and by injection into the lesion, while others have given the Alcresta ipecac two or three times a day in ten-grain tablets. The question, however, is raised that there are so many slight abrasions of the gingivæ and numerous inaccessible pockets about the teeth that a local treatment would not be as efficient as the systemic. The dose of emetin for an adult is one-half grain daily by hypodermic injection, all cases subjected to at least three days' treatment and none having more than six days, the time being governed by the stage of the disease. Bass and Johns claim that in ninety per cent. of cases the endamœbæ cannot be found after three days' treatment, and that in ninety-nine per cent. they disappear in six days' treatment. Coincidently with removal of the endamœbæ the gums stop bleeding and they begin to heal to some extent. To prevent possible reinfection the mouth should be kept as clean as possible. One or two drops of fluid extract of ipecac diluted in half a glass of water has been recommended as a mouth-wash. If the endamœbæ re-occur in the mouth after four or six weeks, the treatment must be repeated.

UNIVERSITY OF BUFFALO DENTAL DEPARTMENT REPORT.

In order to determine the status of the treatment of pyorrhea based upon the experiments of Bass and Johns and Barrett, investigations have been carried out in the research laboratory of the University of Buffalo Dental Department. The idea of the investigation is to carry out various combinations of treatment, both local and constitutional, to determine which gives the better results. This will necessarily take considerable time, and at the present it is impossible to make any very definite statements.

In the twelve cases examined by Dr. W. H. Lane, the endamœba buccalis has been found. Cases treated with Alcresta ipecac have shown without very careful local treatment a marked improvement in objective and subjective symptoms,

but in no cases after one or two series of treatments, that is, six successive days, have the endamœbæ been eliminated. In other cases treated with Alcresta, with careful local treatment, the results have been a more marked improvement in the local conditions. In other cases treated by instrumentation alone, the improvements have apparently been just as great. Cases treated with emetin hydrochlorid have shown a more rapid improvement, but even in these, contrary to the findings of Bass and Johns, it has been possible to demonstrate the presence of endamœbæ after six days' treatment.

A noticeable fact in connection with the administration of ipecac by mouth is the improvement of stomach conditions. In a number of cases, the patients, as might be expected, have been sufferers from stomach trouble, and these have shown marked improvement.

While it is impossible at this stage of the investigations to make any very definite statements, it seems that the treatment with the emetin hypodermatically gives better results than ipecac by mouth; also that careful local treatment without ipecac or emetin in any form gives equal results. Though it does not seem probable that the endamœba buccalis is the cause of pyorrhea, that its actions may prepare the way for the ravages of pus-producing bacteria seems quite probable. It is not a pathogenic organism in this location. The fact that the disease readily recurs if proper prophylactic measures are not carried out demands that the dentist shall not give up his old ideas of treatment for a method which falls far short of the ideal.

GRATWICK LABORATORY REPORT.

In this laboratory, Dr. Moss has treated about fifty cases of pyorrhea alveolaris by subcutaneous injections of emetin hydrochlorid, and in re-examination of a majority of them has only found two cases of a recurrence of endamœba and these might have come from reinfection. He also states that it does not seem likely that the removal of endamœbæ alone will cure the disease, but that the most rigid surgical and prophylactic treatment must be the follow-up work of the dentist. Neither does Dr. Moss believe that the endamœba buccalis is a pus-producing organism, but that it may pave the way for such bacteria later on. He has not had sufficient time, however, in which to prove these statements.

While there is much dispute in regard to the cause and treatment of pyorrhea alveolaris, there are some statements regarding the inception of this disease which every general practitioner should have firmly fixed in mind. It is stated that over ninety-five per cent. of the adults examined by Bass and Johns had pyorrhea. It has also been shown that ninety per cent. of the cases of this disease are directly caused by faulty operations upon the teeth or injury to the septal issues at the time. These include (*a*) poor approximal contact, which is divided into lack of contact, improperly placed contact points and too much contact; (*b*) leaving large masses of filling materials beneath the gingiva in the interproximal spaces; (*c*) injury to the septal tissues in the use of clamps, separators, and matrices, also in the application of ligatures in adjusting the rubber dam and in the use of strips and disks in the finishing of fillings. The restoration of occlusal surfaces is just as important, the tooth being as dependent upon its intercuspal relations as it is upon its approximal contact, to remain in proper alinement. This fact brings to mind the prominence which malocclusion of the teeth assumes in association with this disease; it should be considered as an etiological factor. (*d*) Bass and Johns as well as other investigators claim that the endamœbæ do not attack normal tissue, that it must be damaged in order for them to find lodgment and to develop.

In view of the foregoing statements, it is obvious that the future generations cannot escape from the destructive influences of pyorrhea through the administration of drugs, but that they

may be saved from the inception of this disease in very many cases by a more intelligent and careful technique by the general practitioner.

ORAL SURGERY.

While there is nothing distinctly new in this field of dentistry, there is no lack of interest in the ultimate results of the latest treatment of the diseases of the oral cavity.

This subject opens up an enormous field, of which the general practitioner must have a fair knowledge. That is, he must be sufficiently familiar with the etiology of pre-cancerous conditions, with the lesions of syphilis, and with tuberculosis, to refer them to the proper channels for treatment. Many times the source of cancer in the mouth has been traced to broken teeth, ill-fitting dentures, roughened edges of bridge work and the bands of crowns which are deeply embedded in the gingival tissues. These are conditions which occur in everyday practice, and we are not doing our full duty toward mankind if we neglect these rare opportunities of service.

CONDUCTIVE ANESTHESIA.

While this is among the later methods of employing local anesthesia, it should not be commonly used for all minor cases. It requires very delicate technique, because the injection is made directly within or at the orifice of the bony canals which contain the nerve trunks. This procedure also calls for an intimate knowledge of the anatomic landmarks about the foramina, as well as of the position of the structures which lie in the immediate vicinity. Caution is again made against any lack of strictest asepsis in the preparation of the solution, and in the maintenance of suitable instruments for this class of work. The technique of making these injections is to be found in our latest text-books upon anesthesia.

TOOTH EXTRACTION.

Extraction is becoming more of a science, and a definite technique is being worked out. The importance of asepsis is better understood, and the necessity of post-extractive treatment of the tooth socket is nowadays considered a necessity. The value of the microscope and bacteriologic technique in the diagnosis of oral lesions is being recognized to a considerable extent, so that altogether the dentist is no longer a man of haphazard chance.

ORAL HYGIENE.

The oral cavity is of so great importance to bodily health that it is fast coming into prominence as a new field of investigation. It has been ignored by the medical as well as the dental profession altogether too long. If any other part of the human body indicated the amount of infection which the mouth shows, for instance, upon examination of the tongue, the medical man would say that such a focus of infection was a menace to the general health, and should have immediate attention. Since rheumatism, arthritis, kidney disorders, and endocarditis have been traced directly to infection about the teeth, the physicians and dentists have begun to realize the gravity of the situation.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

SOME POINTS IN SOLDERING.

By E. L. KANAGA, D.D.S., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, at its monthly meeting, April 27, 1915.)

SOLDERING is a process of uniting two metals by fusing into them another metal having a lower melting-point than either of the two metals to be joined.

The strength of a soldered joint depends (1) upon the surface of contact; (2) the amount of solder used; (3) the degree to which the solder is fused into the other metals. If two pieces of metal have a large area of contact and a minimum amount of solder is well burned into them, the highest degree of efficiency is obtained. In such a joint no free solder exists. "Burning in," as I call it, is accomplished by keeping the piece hot for a few moments after the solder has melted. This causes the two metals to alloy with each other. In other words, the low-fusing metal burns into the high-fusing metal. The fusing-point of the solder is then raised because it has taken up some of the higher-fusing gold, and the fusing-point of the other is slightly lowered. This point is well illustrated by the example of soldering platinum with pure gold. Practically as good a joint can be made by burning pure gold into platinum with the ordinary blowpipe as can be gotten by the use of platinum solder and the oxyhydrogen blowpipe. This is done by maintaining the piece at a white heat for a minute or two, when it will be found that the yellow metal has entirely disappeared and the piece is all one color. The two metals have alloyed. The pure gold is no longer pure gold: it does not melt at the fusing-point of pure gold, but at a much higher temperature on account of the platinum which it has taken up. So it is with the gold-and-solder joint. The resulting fusing-point depends upon the amount of solder used. If a large quantity is used the fusing-point will be low; if a very small quantity is used it will be much higher—in fact, very little below that of the metals joined.

If two metals to be soldered together are not in good contact, necessarily more solder must be used to fill the space, and this cannot be burned-in to any extent. In this case we are dependent upon a small quantity of a very weak and brittle metal for the strength of the entire piece. However, the physical weakness of a band made after this fashion of soldering is not its greatest objection; such a joint is quite liable to open at a subsequent soldering. Ideal soldering of joints is just a step lower than sweating, which is an actual melting of the two ends together. It is very good practice to use less and less solder until the joints can be made without it. The advantages of the sweated joint are threefold—it does not show, it is much stronger, and it does not open at a subsequent soldering.

Soldering or sweating bands should be done with the blowpipe, the Melotte being probably the best for this purpose. The flame should be about an inch long, using just enough air to keep it blue. It is necessary to concentrate the heat at one point. It is also very necessary to keep the blue point of the flame in direct contact with the gold. If the area to be soldered is kept covered with the flame no oxidation is possible, because no oxygen can get to the part—it is burned up in the flame. But if the flame is held at a slight distance from

the gold, oxidation takes place rapidly, and often the solder will not flow.

The usual error in soldering is the use of too much heat. In soldering bands, for example, a flame should be used which is large enough to generate a temperature above the fusing-point of solder but below the melting-point of the plate metal.

Stronger joints are made by lapping the ends of the metal, because the surface of contact is greater. In the butted joint the area of contact is equal only to the thickness of the metal. With the lapped joint the surface of contact may be made as great as desired. The ends should be lapped at least twice the thickness of the metals. The outside of the inner end should be filed to a knife edge, so that the inside of the band will be left smooth; the outer edge can be filed down after the crown is finished.

In soldering floors or cusps to bands the Bunsen burner should be used. The piece should be held at the blue point in such a way that it is entirely enveloped in the flame; then the air cannot get to the gold and no oxidation occurs.

INVESTING AND SOLDERING BRIDGES.

There are many materials used in combination with plaster for investments, such as powdered asbestos, asbestos fiber, marble dust, pumice, white sand, and red birdsand. The latter is very fine and contains a good deal of clay. I know of no better investment than is made from two parts of plaster and one part of this bird-gravel. If such an investment is allowed to dry over night, just as the brick and tile makers thoroughly air-dry their materials before firing, it will get very hard, no wiring will be necessary, and there will be no danger of fracture during soldering.

Bridges should be invested so that the facings lie in a horizontal position. The piece should have sufficient thickness up and down to give the necessary strength, and be trimmed fairly close on the sides and ends. About half of each lingual cusp should be left free in open space. They need no protection from the sand and plaster, and in fact, being the greatest bulk of metal, require this exposure so that they may be easily heated. The cusps of shell crowns particularly should be partially uncovered, for they must attain a certain temperature before the solder will readily attach to the band. If these cusps are covered and the flame directed upon the band for soldering, their greatest bulk conducts the heat away almost as fast as it is applied, whereas if the cusps are first heated they will aid in keeping the bands up to the temperature to receive solder. To repeat: Covering the entire cusps with investment is no protection to them, but rather endangers the chances of success. The idea of the investment should not be to protect the piece from burning, but merely a means to hold the various units together while soldering. The only protection the sand and plaster affords is to keep borax away from the facings. Of course if there are any air-bubbles within a band, the heat is not conducted away as rapidly at that point, and it is liable to burn.

Investments should preferably dry for several hours to obtain the greatest strength from the composition, but if time is limited the heating up may begin as soon as the investment is hard enough to handle. A low flame should be applied first, until the piece is thoroughly dry. This is merely to obviate the danger of explosion from too rapidly generating steam within the investment. When dry the flame may be turned on full, and after about fifteen minutes the large brush flame from the blowpipe should be added, being careful only to keep it away from the pins of the facings. When brought to a red heat the investment should be drawn to the front of the fire, and the flame of the blowpipe cut down to about two inches in length, with just enough air to make a slight hissing sound. A very minute quantity of powdered borax may be thrown upon the gold at this time. The solder being cut in long strips should be fed in, di-

recting the flame now upon the strips. If the investment has been carried to a full red heat the gold is at a temperature sufficiently high to take the solder, and it is necessary only to melt the latter. The solder should be frequently dipped into the borax solution to keep it clean, and if that which has been melted into the bridge begins to crust, a very small quantity of powdered borax should be added to it. If the gold cools down to such an extent that the solder will not attach to it, it is very unwise to direct a small, hot flame upon a band in order to force the solder. In such a case the investment should be reheated to the proper temperature.

The practice of coating all parts with a thick borax paste and applying the solder in small pieces before heating is wrong. Such a quantity of borax at the beginning is unnecessary and objectionable. The tendency, as a rule, is to use too much borax, and this causes more checked facings than anything of which I know. The gold in the investment does not oxidize so readily; it is the solder which should receive the flux. In applying the solder in small squares and numerous pieces at a time, it is quite easy to incorporate particles of borax, which cause pits in the finished piece. The solder should be fed-in from one side, and only as fast as it will flow of its own accord. That is, it should not be forced so that it folds over and carries down the oxidized surfaces. When the solder in a bridge is solidified and it is necessary to add to it, the first should be brought to a complete liquid state before making the attempt, otherwise borax will be incorporated beneath the surface, and pits result.

Broken facings are the result of three errors of manipulation, namely, burning borax into the porcelain, too close contact between the facings, and the rapid heating of the pins.

Borax burned into the porcelain lowers the fusing-point, and it actually burns, so to speak. The rate of expansion is greater in the contaminated portion, and cracks and checks result.

If facings are tight together when invested they have no room to expand when heated, and fractures follow. It is often desirable to have the teeth quite close together in an anterior bridge. To avoid breaking the facings in such a case it is best to arrange them without regard for this point at first, then, after having made a wall of plaster to preserve the original set-up, grind the approximal surface of each facing a trifle. The space obtained by a mere touch on the stone will not be noticeable, but will suffice to allow the porcelain to expand without checking.

The sudden heating-up of the pins is a common cause for broken facings. The smaller bulk of metal heats and expands more rapidly than the porcelain. It is a bad idea to burn the wax out of an investment before placing it over the furnace, for a mere flash of the flame on to the exposed pins is enough to ruin the piece before the soldering is begun. The wax can easily be lifted out in one piece when the investment begins to warm-up from underneath.

Pouring hot water into an investment to boil out the wax is unnecessary. It is possible to check the facings in this way, and it also weakens the investment. Facings seldom break from too rapid cooling. If they do break for this reason, however, it is because the porcelain contracts more rapidly than the pins. This is an improbable occurrence where the tooth is embedded in investment.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

BLOOD CHANGES PRODUCED BY NITROUS OXID AND OXYGEN ANESTHESIA IN BOTH MAN AND LOWER ANIMALS.

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(Read before the Academy of Stomatology of Philadelphia, at its monthly meeting, April 27, 1915.)

AERIFORM substances passing through the nostrils and mouth enter the bronchi, thence through its subdivisions, the acini and alveoli of the lungs, entering the blood stream by diffusion and osmosis through the mucosa of these tissues. The statement has been made many times that the blood does not undergo any changes during anesthesia produced by nitrous oxid, but I have seen patients become livid and deeply cyanosed under its influence. I have also observed the meningeal circulation exposed under this anesthetic, and have noted the congestion of these tissues to such an extent that they have almost bulged over the edges of the cranial opening. As the patient became cyanosed, the vessels would stand out like small cords.

BLOOD PRESSURE.

At the February meeting of the Section of Anesthetics of the Academy of Stomatology of Philadelphia, the pressure of the blood was demonstrated: the circulation in the brain of a rabbit was greatly congested under anesthesia, and twice before the death of this animal, blood spurted from the broken-down tissues as the result of pressure in some of the vessels within the area exposed by the trephine.

JACTITATION.

In the rapid induction of anesthesia with nitrous oxid, jactitation may be produced to the extent that the patient is jerked from the chair, as has been related by some English writers. Jactitation, however, does not occur in patients or animals when the nitrous oxid is given slowly and steadily with a liberal admixture of air or oxygen, and we may further produce a complete and satisfactory anesthesia without great lividity and without cyanosis if oxygen is mixed with the nitrous oxid in proper proportions. Anesthesia may be still more advantageously controlled by the judicious use of the rebreathing apparatus that is supplied by many of the manufacturers. This rebreathing bag should be placed as near the patient as possible, and should be attached to the exhaling valve of the nitrous oxid apparatus in such a manner that the fresh gas will not be mixed with the breathed gas. The breathing gas can thus be held in reserve, and can be delivered to the patient as suggested to the operator by the patient's appearance. The operator should always bear in mind the fact that the tissues may be so abundantly supplied with oxygen that the ordinary waste processes will not be carried on, and he would thus lose the primary stimulus to respiration through carbon dioxid.

CHANGES PRODUCED IN THE BLOOD BY NITROUS OXID.

The statement that the blood undergoes no changes during nitrous oxid anesthesia is based upon the researches

of Dr. Ludimar Hermann, published in 1864 in Reichert's and DuBois Reymond's *Archives,* page 521, and 1865, page 469. His conclusions are: "It would appear that while laughing-gas is very readily absorbed by the blood, it neither enters into combination with, nor produces changes in, nor suffers changes from, the action of the blood. On the contrary, it is merely physically absorbed, and blood will take up rather less of it than it will of water; that is to say, one hundred volumes of blood will, at the temperature of the body, absorb somewhat less than sixty volumes of laughing-gas. Blood saturated with laughing-gas shows no signs of change. The spectrum appearances are the same; the blood corpuscles are unaltered, and the oxygen is not driven out."

The bluish appearance of the face that comes to the patient so quickly under a full atmosphere of nitrous oxid is an evidence, to my mind, that some radical change is occurring in the blood. Lack of conclusive findings in this direction stimulated Dr. A. E. Bassett and myself with the desire to extend our knowledge of the behaviour of the blood under nitrous oxid anesthesia by means of animal experimentation. Accordingly, during March and April 1913, assisted by Dr. Nathaniel Gildersleeve, of the department of hygiene of the University of Pennsylvania, who carried on the microscopic and spectroscopic tests, we made the series of experiments to be described.

In these experiments nitrous oxid and air were used, as oxygen in the pure state was not available. There was no reducing valve attached to the nitrous oxid container, so we first passed the gas through a water-bottle in order to have a sight-feed and to prevent injury to the subject from the great pressure accompanying direct delivery of the gas from the cylinder. The water bath further assisted in warming the gas to room temperature.

The subjects selected were a number of rabbits furnished to us by the janitor of the laboratory. Five experiments were made, as follows: A test of the blood supply was made in each case, before the gas was administered, and repeated every ten minutes during the anesthesia, until we had four tests for hemoglobin. The spectroscopic examinations showed that hemoglobin was continually reduced, the greater reductions taking place when the animal was cyanosed and near collapse. No Tallquist or percentage observations were made.

TEST FOR COAGULATION.

The time for blood coagulation was taken immediately before the administration of the anesthetic and repeated every fifteen minutes during the continuation of the anesthesia, which in each case lasted for an hour. In the first case, the time of coagulation before anesthesia was 5 min. and the last count 3 min. 35 sec. In the second case the first count showed 4 min. 30 sec., the last 3 min. 15 sec. The counts made in the case of the third rabbit corresponded so nearly with the first two that no record was made of the time. The fourth rabbit showed signs of weakness after six minutes of anesthesia, but was restored by means of air being blown into the lungs at intervals corresponding to normal respiration. By very careful administration of the anesthetic we were able to continue the anesthesia for twenty minutes, making twenty-six minutes from the beginning of the administration, at which time death came very quickly and unexpectedly.

POST-OPERATIVE FINDINGS.

Post-operative examination showed the brain to be apparently normal, the kidneys normal, and an acute dilatation of the heart, which no doubt occurred in this animal at the time of the first collapse.

Report of Experiments on Rabbits

IN THE HYGIENE LABORATORY OF THE UNIVERSITY OF PENNSYLVANIA, UNDER THE AUSPICES OF THE ANESTHESIA COMMITTEE OF THE ACADEMY OF STOMATOLOGY, 1915.

Experiment No. 1. For purposes of experiment, a rabbit weighing 2½ lb., of

healthy appearance and not having been subjected to previous laboratory experimentation, was selected. At 8 P.M. a very gradual dose of nitrous oxid and oxygen was administered, and anesthesia was produced in seven or eight minutes. At the end of fifteen minutes a second specimen of the blood was taken by Professor Gildersleeve for spectroscopic examination, which showed a decrease in hemoglobin. The first specimen was taken before anesthesia began, so as to furnish a means of comparison with the normal. Twenty-five minutes from the beginning of the administration the anesthetic was pushed so that the animal was near collapse, when a third specimen of the blood was taken, which on examination showed a fourth movement of the lines of the spectrum, indicating a further decrease of hemoglobin. The subject was held in this deep anesthetic stage for another fifteen minutes, the supply of oxygen being varied according to indications during the entire time, which was fifty minutes from the time the first gas was given. At this time the animal was apparently dead, as the respiration had ceased for five minutes and the heart had lost its rhythmical beat—only an occasional throbbing perceptible. The operator, however, declared that there was hope of reviving the animal by artificial respiration. The respiration and heart-beat were indeed restored to almost normal. Artificial respiration was supplemented by one of the operators blowing into the supply tube. This not only furnished warm air to the subject, but a proper mixture of carbon dioxid as a stimulant to respiration, which Dr. Bassett and myself have both found to be the best restorative. At this time the subject was given a full atmosphere of nitrous oxid, and complete collapse occurred at the end of three minutes, the heart ceased to beat at the end of seven minutes from the time of the administration of the complete dose of nitrous oxid. Further examination of the body was made by Dr. Robert N. Wilson, and it was found to be in normal condition, although we expected to find acute dilatation of the heart, as was found in the case of accidental death which occurred in our experiments in 1913; this will be referred to again in a subsequent paper. No record was made of the time of the coagulation of the blood in this case, but we found the hemoglobin showing the same amount of reduction under nitrous oxid and oxygen as in the experiments with nitrous oxid and air reported above.

Experiment No. 2. Our second experiment was made upon another rabbit weighing 2½ lb. The animal was anesthetized by Dr. J. R. Lilliandol. Administration of the anesthetic began at 8.06 P.M., with a complete atmosphere of 10 per cent. oxygen and 90 per cent. nitrous oxid, supplemented by constant rebreathing. At the expiration of six minutes the animal showed signs of very marked collapse, at which time respiration ceased, but the heart action remained normal. The inhaler was removed, and artificial respiration induced by compressing the abdominal viscera, and in three minutes the animal was restored. The inhaler was again applied loosely, so that the subject received a mixture of air and gas sufficient to maintain complete anesthesia. At the end of forty minutes the cranium was opened for the purpose of observing the distended condition of the tissues under gas-oxygen anesthesia. After ten minutes a complete atmosphere of nitrous oxid was given, and the animal ceased breathing in less than three minutes, but the heart continued to beat for six minutes. The chest walls were then opened, and the heart and lungs removed and placed in a salt solution, in which the heart continued a rhythmical beat of forty to a minute for eleven minutes. At the end of eleven minutes the ventricular beat diminished, and at the end of seven additional minutes, the auricle was pulsating from six to ten times more than the ventricle. At the end of thirty minutes, after the heart had ceased to beat, there was an occasional contraction of the auricle and the ventricle.

Tests of Blood under Nitrous Oxid Anesthesia.

The following additional tests of the blood under nitrous oxid anesthesia were made by Dr. E. Q. St. John of the Philadelphia Clinical Laboratory:

No. 1. Boy, age seventeen. Weight 97 lb., blood pressure 132, diastolic pressure 85, radial pulse 68; slight a decrease in the hemoglobin of from 82 to 77 per cent. (See Table No. 1.)

No. 2. Miss B., age twenty. Weight 120 lb., blood pressure 110, diastolic pressure 75, radial pulse 72. There was no excitement during the administration of the gas, which continued for forty-five minutes. Complete anesthesia was induced during the last twelve

(1)

PHILADELPHIA, November 18, 1915

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case I. - Mr. R. P.

	Before N_2O + O	Immediately after N_2O + O
Haemoglobin	77%	82%
Actual Quantity	10.55%	11.23%
Color Index	1	1
Erythrocytes	3,888,000	3,424,000
Poikilocytes		
Nucleated Cells		
Leucocytes	7,500	8.500
Polynuclear Neutrophiles	94.6%	80 %
Small Lymphocytes	0.3%	13 %
Large Lymphocytes		2.5%
Transitional		
Eosinophiles	4.6%	4 %
Basophiles	0.5%	0.6%
Myelocytes		
Polynuclear Neutrophiles —		
1 Segment		
2 Segments, Connected		
2 Segments		
3 Segments		
4 Segments		
5 or more Segments		
Time of Coagulation		
RATIO OF WHITE TO RED CELLS	1:491	1:402
BLOOD PRESSURE Systolic	132	132
Diastolic	85	85

mitral murmur. General appearance anemic. Gas was administered for the purpose of excavating several carious cavities in the teeth. This required forty-five minutes, after which time complete anesthesia was induced for the extraction of three badly broken-down teeth, complete anesthesia lasting about seven minutes. The blood count was taken just as the patient ceased to breathe the gas, and showed a loss of a quarter of a million erythrocytes, an increase of one thousand leucocytes, and minutes of the administration. There was a desire to rest for some twenty-five minutes after recovery from the anesthesia. This patient had run the gamut of specialists in two cities. Radiographs had been taken of all her teeth in an effort to determine whether the constant headache which she had endured for six months could in any way have originated from the teeth; the oculist had changed her glasses; the rhinologist had made an examination of her nose and throat; the blood and se-

(2)

PHILADELPHIA, January 8, 1915

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case II. - Miss B.

	Before N_2O+O	Immediately after N_2O+O
Haemoglobin	77 %	73 %
Actual Quantity	10.54%	10 %
Color Index	0.8	0.9
Erythrocytes	4,488,000	3,800,000
Poikilocytes		
Nucleated Cells		
Leucocytes	5,500	8,500
Polynuclear Neutrophiles	58.3%	58 %
Small Lymphocytes	32.5%	32.6%
Large Lymphocytes	3.5%	1 %
Transitional	5 %	6.5%
Eosinophiles		1.5%
Basophiles	0.6%	0.3%
Myelocytes		
Polynuclear Neutrophiles		
1 Segment		
2 Segments, Connected		
2 Segments		
3 Segments		
4 Segments		
5 or more Segments		
Time of Coagulation	4'	3'
RATIO OF WHITE TO RED CELLS	1:516	1:447
BLOOD PRESSURE Systolic	110	110
BLOOD PRESSURE Diastolic	75	75

(3)

PHILADELPHIA, February 24, 1915

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case III. - Miss L. R.

	Before N_2O+O	Immediately after N_2O+O	10 minutes after N_2O+O
Haemoglobin	79 %	80 %	78 %
Actual Quantity	10.82%	10.96%	10.68%
Color Index	0.9	0.8	0.8
Erythrocytes	4,316,000	4,528,000	4,772,000
Poikilocytes			
Nucleated Cells			
Leucocytes	6,500	9,500	5,500
Polynuclear Neutrophiles	56.6%	48.7%	
Small Lymphocytes	32.3%	42.6%	
Large Lymphocytes	1.5%	1.4%	
Transitional	6.2%	3.8%	
Eosinophiles	3.4%	2.7%	
Basophiles		0.6%	
Myelocytes			
Polynuclear Neutrophiles			
1 Segment	8.3%	21.4%	
2 Segments, Connected	13.8%	7.3%	
2 Segments	49.7%	55.3%	
3 Segments	25.8%	15.2%	
4 Segments	2.3%	0.8%	
5 or more Segments			
Time of Coagulation			
RATIO OF WHITE TO RED CELLS	1:664	1:478	1:867
BLOOD PRESSURE Systolic	120	130	
BLOOD PRESSURE Diastolic	80	80	

(4)

PHILADELPHIA, December 30, 1914

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case IV. Mrs. H.

	Before N_2O + O	Immediately after N_2O + O
Haemoglobin	89 %	93 %
Actual Quantity	12.19%	12.74%
Color Index	0.9	1
Erythrocytes	4,640,000	3,360,000
Poikilocytes		
Nucleated Cells		
Leucocytes	10,000	10,000
Polynuclear Neutrophiles	66 %	56.5%
Small Lymphocytes	28.7%	35.5%
Large Lymphocytes	1.8%	1.3%
Transitional	1.1%	5.5%
Eosinophiles	1.8%	1 %
Basophiles	0.6%	0.2%
Myelocytes		
Polynuclear Neutrophiles		
1 Segment		
2 Segments, Connected		
2 Segments		
3 Segments		
4 Segments		
5 or more Segments		
Time of Coagulation		
RATIO OF WHITE TO RED CELLS	1:464	1:336
BLOOD PRESSURE Systolic	120	130
BLOOD PRESSURE Diastolic	80	80

(5)

PHILADELPHIA, January 14.1915

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case V. - Mrs. W. L. C.

	Before N_2O+O	Immediately after N_2O+ O	Two & One-half hours after N_2O +O
Haemoglobin	86 %	85 %	
Actual Quantity	11.78%	11.64%	
Color Index	1	1	
Erythrocytes	3,528,000	3,128,000	4,640,000
Poikilocytes			
Nucleated Cells			
Leucocytes	6,500	6.500	
Polynuclear Neutrophiles	57 %	58 %	
Small Lymphocytes	36 %	33 %	
Large Lymphocytes		3 %	
Transitional	5.3%	6 %	
Eosinophiles	1.4%	2 %	
Basophiles	0.2%		
Myelocytes			
Polynuclear Neutrophiles			
1 Segment			
2 Segments, Connected			
2 Segments			
3 Segments			
4 Segments			
5 or more Segments			
Time of Coagulation	4'	3'	
RATIO OF WHITE TO RED CELLS	1:542	1:481	
BLOOD PRESSURE Systolic	110	110	
BLOOD PRESSURE Diastolic	70	70	

(6, A)

PHILADELPHIA March 19, 1915

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case VI.-A. Miss W.

	Before N_2O+O+Ether	Immediately after N_2O+O	40 minutes after N_2O+O
Haemoglobin	75%	75 %	75 %
Actual Quantity	10.27%	10.27%	10.27%
Color Index	1	1	1
Erythrocytes	2,926,000	4,008,000	3,524,000
Poikilocytes			
Nucleated Cells			
Leucocytes	12,000	15,500	9,500
Polynuclear Neutrophiles	58 %	66.3%	70 %
Small Lymphocytes	27.6%	23.3%	21.6%
Large Lymphocytes	3 %	2.3%	0.7%
Transitional	10.7%	6 %	6.3%
Eosinophiles	1.4%	1 %	1 %
Basophiles	1.2%	1 %	0.3%
Myelocytes			
Polynuclear Neutrophiles			
1 Segment	11.3%	7 %	9 %
2 Segments, Connected	9.2%	12 %	6.7%
2 Segments	49 %	53.5%	58.4%
3 Segments	27 %	23 %	21.4%
4 Segments	3 %	4.5%	4.3%
5 or more Segments	0.5%		
Time of Coagulation			
RATIO OF WHITE TO RED CELLS	1:244	1:258	1:370
BLOOD PRESSURE Systolic	120	132	
BLOOD PRESSURE Diastolic	85	86	

(6, B)

PHILADELPHIA March 30, 1915

Blood Examination

PHYSICIAN Dr. T. D. Casto

PATIENT Case VI. - B. Miss W.

	Before N_2O+O	Immediately after N_2O+O	20 minutes after N_2O+O
Haemoglobin	83 %	83 %	83 %
Actual Quantity	11.27%	11.27%	11.27%
Color Index	0.9 %	1	1
Erythrocytes	4,248,000	3,036,000	3,736,000
Poikilocytes			
Nucleated Cells			
Leucocytes	12,000	5,500	9,000
Polynuclear Neutrophiles	59 %	54 %	55%
Small Lymphocytes	29.6%	32.5%	34.4%
Large Lymphocytes	4.6%	1.5%	3.6%
Transitional	5 %	11 %	5 %
Eosinophiles	2 %	1 %	1.7%
Basophiles	0.6%		0.3%
Myelocytes			
Polynuclear Neutrophiles			
1 Segment	5.5%	3 %	11 %
2 Segments, Connected	2.1%		2 %
2 Segments	48.2%	44 %	52 %
3 Segments	36.3%	48.5%	33 %
4 Segments	6.2%	4 %	2 %
5 or more Segments	1.5%	0.5%	
Time of Coagulation	3'	2'	3'
RATIO OF WHITE TO RED CELLS	1:354	1:550	1:415

cretions had been thoroughly examined by competent laboratory men. Lumbar puncture had been resorted to, which, however, only gave a slight temporary relief from pain. (Table No. 2 shows the differential counts in this case.) No cause being found for the pain, the patient was pronounced hysterical and placed in one of our best hospitals for a five weeks' rest, which, however, failed to benefit her. Another radiograph was taken of the posterior portion of the cranium, and showed a noticeable thickening of the occipital bone and of the posterior portion of the parietal bone. This was diagnosed as the cause of the trouble, and the patient left without any hope of relief.

No. 3. Miss R., age twenty-three. Weight 110 lb., blood pressure 120, which rose to 130 under anesthesia; radial pulse 72. The patient was very excitable and proved to be an ideal analgesic patient. Gas was administered for fifty minutes, during which time the patient was continuously telling us what a good time she was having. In this case the blood test showed a loss of a quarter of a million erythrocytes, and a very marked increase of 3000 leucocytes, the leucocytes returning to practically normal, or 5500, in ten minutes after recovery from the anesthesia. (See Table No. 3.)

No. 4. Mrs. H., age forty-five. Blood pressure 120, diastolic pressure 80, radial pulse 80. No marked change was observed under the gas anesthesia. The patient did not become excited under anesthesia, as she had often taken gas for similar operations. Analgesia and anesthesia were prolonged for about twenty-five minutes for the removal of a tooth pulp. (See Table No. 4.)

No. 5. Mrs. C., age thirty-five. Weight 130 lb., blood pressure 110, diastolic pressure 70, radial pulse 72. This patient had often taken gas for cavity preparations, and preferred anesthesia in any instance to the least pain. She was given gas for an hour and thirty minutes. The blood test showed a decrease in the erythrocytes of 400,000 per cubic millimeter. The patient expressed a decided desire to rest after the anesthesia, the rest terminating in sleep for twenty minutes. After two hours' rest and a light luncheon, the erythrocytes showed an increase to 4,640,000. This patient had used the gas for one hour the day before. (See Table No. 5.)

No. 6. (A) Miss W., age twenty-six. Blood pressure 120, rising during the gas anesthesia to 132. There was constant tendency to rigidity of the limbs under anesthesia. She was very excitable and a very difficult anesthesia patient. She was kept under anesthesia for about fifty minutes. The ratio between red and white blood cells was, before anesthesia 1 : 244, after anesthesia 1 : 258, and later 1 : 270. (See Table No. 6, A.)

(B) This patient, as has been said, is most difficult to control under analgesia. It would be almost impossible to perform any painful operation on her teeth without the aid of an anesthetic. As the gas intoxication approaches she becomes very rigid, always raising her hand in protest as long as she retains her faculties. The patient at times places her feet firmly on the foot-rest of the chair and assumes a partially erect position. The first count for red blood cells seems low, which, a very good pathologist suggested, was caused by a profuse menstruation which had ceased only six days previous to the administration of the gas. The low count was followed in this case by a rise of 1,500,000, which was attributed to the fact that chlorid of ethyl was given during the last ten minutes of the operation, ether being known to produce an immediate increase of the erythrocytes. The second table of this patient (see Table No. 6, B) shows just about the average change—a 25 per cent. reduction of erythrocytes, with a return of red blood cells after twenty minutes.

DEDUCTIONS FROM EXPERIMENTS.

Our animal experiments seem to prove that the blood does undergo a change during nitrous oxid and oxygen anesthesia; what remains to be proved, however, is the character of the change

in metabolism; whether or not hemolysis occurs; whether this change is of sufficiently long duration to cause permanent injury to the blood or tissues of the body, and whether there is any change in the kidneys which would tend to the production of albumin or indican.

We feel confident, however, that the results of our experiments warrant us in making the following deductions:

The blood pressure is raised under anesthesia with nitrous oxid, especially the systolic pressure, the diastolic pressure varying slightly, thus producing a variation in the arterial pressure, corresponding to the rise in the systolic pressure. When the state of unconsciousness is produced slowly by a liberal addition of oxygen, there is a tendency for the blood pressure to rise, but only when cyanosis appears.

The spectroscopic analyses which were made by Dr. Gildersleeve in the animals experimented upon by Dr. Bassett and myself in 1913, were uniform in showing reduced hemoglobin, the reduction being greatest as the subject approached a condition of collapse. The color index returned to normal and showed the same position in the lines of the spectrum after gas had been discontinued for from twenty to thirty minutes.

The time for coagulation of the blood was decreased on an average more than one minute, returning to normal in about twenty minutes after discontinuance of the gas.

The blood pressure, hemoglobin, and time of coagulation of the blood have been so uniform in showing decreases, as pointed out above, that it would seem to warrant the conclusion that these are constant under nitrous oxid anesthesia.

FURTHER EXPERIMENTS IN HUMAN SUBJECTS.

It was now suggested that some similar tests should be made on patients in practice, but, although I have a very good clinic at the Philadelphia Postgraduate School of Dentistry, it was soon apparent that the patients were not of the proper mental attitude to submit to having their digits punctured in the interests of science. This difficulty compelled me to select, from my regular practice, patients who would allow these tests to be made, and I was fortunate in securing the consent of several for this purpose. The gas given in these cases was mixed with a liberal proportion of oxygen, and the rebreathing bag was used. Examination of the blood in these cases showed a very slight decrease in hemoglobin, and the tests for coagulation showed the time for coagulation to be reduced from one-half to one minute.

In counting the number of erythrocytes and leucocytes, a single Thoma-Zeiss pipet was used. The blood was drawn to the 0.5 mark on the pipet, which was immediately filled with Toisson's solution to the 100 mark. The Türck counting chamber was used, and was filled twice for every case; 288 of the large squares were always counted for the leucocytes, and 200 of the small squares for the erythrocytes. For the estimation of the hemoglobin the Dare's hemoglobinometer was used in every case, as was also the Tallquist hemoglobin scale—the latter, however, was not found to be sufficiently accurate, the Dare hemoglobinometer being far more reliable.

The coagulability of the blood was estimated with the Dorrance coagulometer.

In order to estimate the percentage of the different varieties of leucocytes, smears of the blood were made on glass slides, dried in the air, and fixed and stained with Jenner's stain. In every case, between 400 and 500 leucocytes were counted.

The Arneth classification of the various polynuclear neutrophils was found to be complicated and too difficult for practical use, but to gain some idea of the possible changes that may have occured to the nuclei of the polynuclear neutrophils during the inhalation of nitrous oxid, a count was made of the number of cells containing one, two, three, four, and more nuclear segments.

The erythrocytes were reduced ten per

cent. on an average. The microscopist did not detect any change in the morphology of the red blood cells. Poikilocytes and nucleated cells were not found, but a much closer observation will be made in future examinations to ascertain whether or not these are present.

Observations on the effects of any hemolytic action that may occur under gas and oxygen anesthesia in relation to metabolism offer a further field of inquiry open to the histologist.

Differential counts of the leucocytes have not as yet been made in a sufficient number of cases to justify any definite conclusion in this regard, but the results of the tests made so far seem to indicate that there is an increase of about 25 per cent. in white blood cells. In one case we found a decrease in white blood cells of from 12,000 to 5500, followed by a return to normal in twenty minutes after the gas had been discontinued. This observation, however, was made only under analgesia and near-anesthesia.

The lymphocytes, both large and small, undergo a variety of changes under anesthesia and will require many more counts to be made before anything definite can be determined in regard to these changes.

Polynuclear neutrophils show a decrease of about 15 per cent. Observations of these, however, have only been made in three cases, but they are full of scientific interest.

Summing up the results of our findings, which are contrary to those of Dr. Hermann quoted above, we are forced to the conclusion that the blood does undergo changes under nitrous oxid anesthesia. Furthermore, since anesthesia may readily be induced by nitrous oxid and oxygen in combination, we are compelled to conclude that other changes occur besides the loss of the oxygen supply to the tissues; also that nitrous oxid is an anesthetic *per se*. This latter opinion is at variance in some respects with the statement made by Prof. H. C. Wood in 1891, that "Although numerous substances have been tried, there are today only three anesthetics—nitrous oxid, ether, and chloroform; of these, nitrous oxid stands apart, because it induces loss of consciousness not by virtue of any inherent properties, but simply by shutting off from the nerve centers the supply of oxygen."

Differential Blood Counts Reported by Anders and Boston.

In 1904, J. M. Anders and L. N. Boston made differential blood counts in a number of animals and recorded their findings, together with those made in three human subjects, in the *Therapeutic Gazette* for November 1904. The record of one of these cases I have included in this report, so that a parallel may be drawn between the changes in the blood under ether and those under nitrous oxid. A patient was employed by these investigators for experimental purposes, and, as no operation was required, a purgative was not given previous to the administration of the anesthetic.

J. H., male, age thirty-three, apparently in good health, was given ether without previous purging.

1. (*Before ether.*) The red blood cells were 4,080,000; leucocytes, 7600; hemoglobin, 86 to 95 per cent., several estimates being made with different instruments. Stained blood was in every way normal.

2. (*Under ether twenty minutes.*) The red blood cells were 6,150,000; leucocytes, 16,000; hemoglobin, 79 per cent. No poikilocytes; microcytes numerous; no macrocytes found. All cells stained palely but evenly throughout. White cells showed an increase in the polynuclear elements.

3. (*One hour after ether.*) The red blood cells numbered 8,220,000; hemoglobin, 74 per cent. An increase of 2,070,000 cells per cmm. From the degree of cyanosis present it is fair to attribute a liberal portion of this increase to this condition. Hand-in-hand with an increase in the number of red cells there was a loss of 12 per cent. in the hemoglobin. It is at once apparent that 74 per cent. of hemoglobin is an extremely low amount for a blood of such condensation, and that each red cell is extremely poor in coloring pigment. Leucocytes, 9800. The leucocytes, which rose from 7600 to 16,000 during the first twenty-five minutes, had now dropped to 9800, despite the extreme degree of blood concentration.

Studying these figures correlatively, one is forced to believe that a true leukemia existed. Occasionally cells were seen which stained deeply, no crenated cells. Decided variations in size of cell.

Differential count of leucocytes.

	Per cent.
Polymorphonuclear cells,	80.97
Myelocytes,	4.27
Transitional cells,	11.00
Large mononuclear cells,	1.11
Small lymphocytes,	2.22
Eosinophils,	0.43
	100.00

4. (*Twenty-four hours after ether.*) There had been no vomiting, and the patient had taken food, and claimed to feel well. The red blood cells were 4,576,000; leucocytes, 13,600; hemoglobin, 67 per cent. (loss of 19 per cent.). In the stained specimens were seen many macrocytes, many of which stained poorly, some only as shadows, and these were liable to be distorted (poikilocytosis). Leucocytes mostly large mononuclear and polymorphonuclear forms.

5. (*Thirty hours after ether.*) The red cells were 4,600,000; leucocytes, 12,000; hemoglobin, 78 per cent. (increase of 11 per cent. in six hours).

6. (*Forty-eight hours after ether.*) The red cells were 5,700,000; leucocytes, 10,600; hemoglobin, 80 per cent. There was an appreciable increase in the polymorphonuclear elements and in small lymphocytes. Two myelocytes were found. Eosinophilic myelocytes were also present. Some of the cells stained irregularly, but there were no pale cells as previously seen.

7. (*Seventy-two hours after.*) The red cells were 4,780,000; leucocytes, 7400; hemoglobin, from 85 to 86 per cent.

Second etherization:

8. (*Before ether*—patient not purged.) The red cells were 5,005,000; leucocytes, 6700; hemoglobin, 80 per cent. The stained blood appeared perfect in all respects.

9. (*Under ether twenty minutes.*) The red cells were 5,310,000; leucocytes, 8200; hemoglobin, 74 per cent. A few megaloblasts were present, but there was practically no distortion of the red cells; microcytes were few; all red cells stained perfectly; white cells in about normal relation, except for a slight apparent increase in the eosinophils.

10. (*Under ether forty minutes.*) The red cells were 5,250,000; leucocytes, 12,000; hemoglobin, 77 per cent. (Ether discontinued.)

11. (*One hour after starting ether.*) Perspiration free and slight vomiting. The red cells were 5,120,000; leucocytes, 15,000—the gradual rise continued, reaching its maximum number at this stage; hemoglobin, 72 per cent.

12. (*Six hours after ether.*) The red cells were 4,430,000; leucocytes, 11,000; hemoglobin 63 per cent. (a loss of 17 per cent.). Vomited four or five times in the afternoon.

It has appeared to us that this feature (continued reduction of the hemoglobin after anesthesia) is of the utmost importance, especially where a second anesthetic is required, and that it possibly accounts for a fair proportion of deaths following a primary anesthetic. In this patient the red cells were also reduced, and both the erythrocytes and the hemoglobin remained at this low ebb for twenty-four hours. The fact that no operation was undertaken is also to be considered in this connection.

13. (*Twenty-four hours after ether.*) The red cells numbered 3,820,000; leucocytes, 5700; hemoglobin, 63 per cent.

14. (*Forty-eight hours after ether.*) The red cells numbered 3,820,000; leucocytes, 5700; hemoglobin, 70 per cent.

15. (*Seventy-two hours after ether.*) Vomited twice, and there had been moderate sweating. The red cells numbered 5,747,000; leucocytes, 8250; hemoglobin, 73 per cent.

16. (*May 16th; 100 hours after ether.*) Vomited yesterday and this morning; frequent perspiration, anorexia, and constant drowsing. The red cells numbered 3,920,000; leucocytes, 6000; hemoglobin, 76 per cent.

Summary.

	Hemoglobin.	Erythrocytes.	Leucocytes.
Before ether.	86 to 95	4,080,000	7,000
Under ether 20 min.	79	6,150,000	16,000
1 hour after ether.	74	8,220,000	9,800
24 hours " "	67	4,576,000	13,600
30 " " "	78	4,600,000	12,000
48 " " "	80	5,700,000	10,600
72 " " "	85 to 86	4,780,000	7,400

Second etherization:	Hemoglobin.	Erythrocytes.	Leucocytes.
Before ether.	80	5,005,000	6,700
Under ether 20 min.	74	5,310,000	8,200
" " 40 "	77	5,250,000	12,000
" " 60 "	72	5,120,000	15,000
6 hours after ether.	63	4,430,000	11,000
24 " " "	63	4,660,000	5,800
48 " " "	70	3,820,000	5,700
72 " " "	73	5,747,000	8,250
100 " " "	76	3,920,000	6,000
16 days " "	72	5,010,000	5,000

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

PROCEEDINGS OF SOCIETIES.

NORTHEASTERN DENTAL ASSOCIATION.

Twentieth Annual Convention, held at Boston, Mass., October 15, 16, and 17, 1914.

THE twentieth annual meeting of the Northeastern Dental Association was called to order in the Hotel Somerset, Boston, Mass., at 11.30 A.M., October 15, 1914, by the president, Dr. Edgar O. Kinsman, Cambridge, Mass.

The first order of business was the reading of the minutes of the previous meeting. This was dispensed with, on account of the minutes having been printed in the Transactions as distributed to the members.

The report of the Board of Censors was on motion accepted.

The reports of the Treasurer. Dr. D. MANSON, and of the Editor. Dr. E. O. BLANCHARD. were on motion accepted.

Dr. KELLEY moved that a Nominating Committee of five be appointed by the president to bring in a list of nominations for officers for the ensuing year. (Motion carried.)

Motion was then made and carried to adjourn until 2.30.

THURSDAY—*Afternoon Session.*

The meeting was called to order Thursday afternoon at 2.30 o'clock by the president, Dr. Kinsman.

The vice-president, Dr. Maxfield, was called to the chair while the president, Dr. KINSMAN, read his annual address.

Dr. Kinsman resumed the chair and introduced Dr. RICHARD H. RIETHMÜLLER, Philadelphia, Pa., who read a paper entitled "Further Studies on Novocain-Suprarenin Anesthesia."

[This paper, printed in full, will be found (Part I) at page 1320 of the December 1914 issue of the DENTAL COSMOS, and (Part II) at page 842 of the present issue.]

Discussion.

Dr. KURT H. THOMA, Boston, Mass. I think we all appreciate Dr. Riethmüller's paper. There is no nobler task in our profession than the relief of

pain, and this is the principal reason why we all are so deeply interested in anesthesia.

The question whether general or local anesthesia is preferable has been discussed at many meetings. I think that the most important advantages of local anesthesia are—Its safety; its sureness, not needing the co-operation of the patient to get results, as in analgesia with nitrous oxid; the fact that we need no assistant and have no apparatus to watch; the ability of the patient to cooperate during the operation, and therefore the possibility of accomplishing the most delicate operations with success.

These are interesting facts, but as local anesthesia has grown out of its childhood period in this part of the country, we do not need to spend much time to advocate it. I know that a large number of practitioners in New England are using the infiltration as well as the conductive method successfully, but as with every innovation, there is plenty of opportunity for improvement. Dr. Riethmüller has given us valuable new points, part of which appeal to us at once; others we want to think over.

I agree with the essayist that novocain-suprarenin today is unsurpassed, and the best physiological salt solution is undoubtedly the Ringer solution. Whether it be a 0.6 or 0.9 per cent. solution has surely only theoretical value. More important, however, in my mind, is the use of perfect distilled water. Water as bought from the drug store is usually full of fungi of all kinds, and though these are killed when the salt solution is sterilized, their toxins remain. It is highly commendable to procure special distilled water from a reliable source, or by the use of a special apparatus for distilling water.

Regarding the question of preparing the solution, we meet with the most extreme views. While I agree with our essayist that Seidel's method of procuring the solution from separate solutions mixed directly before use is not practical for the reasons mentioned, I disagree with him absolutely in the question of concentration.

Dr. Riethmüller in his essay quotes Seidel, and points out that suprarenin is probably the strongest poison known, and that the toxity of the novocain-suprarenin solution is not so much due to the novocain as to the suprarenin. But later he advocates the use of the E and the G tablets, which both contain the same amount of suprarenin, but vary in the amount of novocain.

I would like to raise the question, why should we want to decrease the amount of novocain, if it is the suprarenin that causes the trouble? And would it not be more scientific to have always the same reliable amount of novocain, which is 2 per cent., but to vary the strength of the suprarenin?

I have pointed out in my recent book on "Oral Anesthesia" that it is of utmost importance to keep a standard percentage of novocain, but to vary the amount of suprarenin in certain cases, and I have proved to my satisfaction that there is absolutely no reason why so high a percentage of the toxic suprarenin should be used as is contained in the E tablets—which is 0.000,05 gram to 1 cc. of salt solution—if we can get the same result with one-third of that amount.

Dr. Riethmüller says that the advantages of the decreased amount of suprarenin are illusionary. I say they are not. We all have had cases showing slight toxic symptoms, which in my opinion are due to the suprarenin in the E tablets, and there is no use denying this. Why, then, should we not reduce the percentage of suprarenin?

I have often received complete anemia with the E tablets used in the infiltration method. Why should we interfere with the circulation to such an extent, if it is not necessary?

I agree that there are cases, especially surgical ones, where anemia is desirable, but this is decidedly not the case in ordinary exodontia, or still less in cases of operative dentistry, and if we want this deep anemia we know how to get it—that is, with the E tablet. Therefore I say we must individualize.

We want to use local anesthesia for

operative dentistry, in our everyday practice. This is different from hospital use, where slight toxic symptoms would not count. But some of our patients, especially the wealthy class, are very sensitive. Therefore I would decrease the amount of suprarenin in the majority of cases, and use a high percentage only in certain cases, where anemia is desired.

Why should we not individualize the doses of such a toxic agent as suprarenin, if the physician changes the doses of much less harmful drugs in every case?

It surely will not seem complicated to a scientific man to use three different solutions, namely, one solution for normal cases, to contain suprarenin 0.000,02 gram to 1 cc.; one solution for profound anemia, as desirable in certain surgical operations, to contain suprarenin 0.000,05 gram to 1 cc.; and one solution for abnormal cases, with the suprarenin percentage still smaller.

So much to show why we should use only one-third of the suprarenin contained in the E tablets, for the larger part of our cases. Now comes the question, Do we decrease by this method the efficiency of the anesthetic? Practical experience shows that we do not. Let us consider separately the different actions of suprarenin, which are as follows:

(1) Anemia. This is not an essential quality in most dental operations; furthermore it is of no use in conductive anesthesia, where the place of injection is remote from the field of operation.

(2) The toxity of this agent is very great; therefore the smaller the doses, the safer the solution.

(3) The suprarenin is added also to prevent quick absorption of the deposited solution. This is its most important function.

I would relate my first case, in which I decreased the suprarenin much below the percentage which I recommend now for normal cases. The patient was sent by a physician to have four molars extracted, one on each side of the maxilla and one on each side of the mandible. After examination, I decided to devitalize and save all these four teeth. The patient had severe cardiac and pulmonary disorders, and his respiration was about 120 per minute. I injected a 2 per cent. solution of novocain with 0.000,01 gram suprarenin, viz, only one-fifth of the suprarenin contained in the E tablets. First I used the infiltration method for each upper molar, then conductive anesthesia for the lower molars. To my great surprise, the anesthesia lasted just as long as it would normally, viz, for about one hour. I then tried modified solutions on other patients, also in patients who had exhibited slight toxic symptoms after all previous injections, and proved to my satisfaction that these symptoms did not then occur, and that the depth or the duration of the anesthesia was not decreased. After having tried out this modified solution sufficiently, I corresponded with the Farbwerke Hoechst Co., who proposed to manufacture the T tablet containing novocain 0.02 gm., and suprarenin 0.000,02 gm. The manufacture of these tablets, however, has been delayed on account of the war, I have therefore, recommended in my book, for the present time, the following solutions, which are very simple to make:

For normal cases: One F plus one E tablet (in 3½ cc. salt solution) gives: Novocain 2 per cent., suprarenin 0.000,015 gm. to 1 cc.

For abnormal cases: Two T plus one E tablet (in 6 cc. salt solution) gives: Novocain 2 per cent., suprarenin 0.000,009 gm. to 1 cc.

For profound anemia: One E tablet to each cc. salt solution gives: Novocain 2 per cent., suprarenin 0.000,05 gm. to 1 cc.

Another very important question, in my mind, is the teaching of anesthesia. What is the best method of instructing students in the technique of local anesthesia? I think the fundamental principle is a thorough knowledge of the oral anatomy, and training for scrupulous, conscientious work.

The best specimens to practice on that I have seen are frozen sections and dissected parts of green skulls, which

Dr. Blum of New York demonstrated at the meeting of the National Dental Association in Rochester, and I think that his method of teaching deserves a good deal of credit. I hope to have such sections in a short time, for use in the Harvard Dental School, to fill the long-noted want of practical experience among our undergraduates.

I am sure that Dr. Riethmüller told us of many a good thing; his paper is very interesting and instructive, and the new instruments which he showed us are constructed very cleverly, and will greatly help to facilitate asepsis.

Dr. Chas. A. Jameson, Boston, Mass. I can hardly be expected to discuss the essayist's paper, as I had the opportunity to read it over only last night. In regard to novocain solutions in 0.9 per cent. normal salt solution, I have noted no difference between those and the Ringer solutions, which I am now using. I have never used the other tablets, as I have so little trouble with the E tablets and shall continue to use them. If a case appears a little suspicious, I use a one per cent. solution, and obtain the same results by waiting a little longer.

Dr. Riethmüller spoke of distilled water and recommended the use of a distilling apparatus. I think that a great help. I was fortunate enough to have one given to me, and I find it a great help in assuring a perfectly fresh solution at all times. I was glad to hear the essayist speak of the disadvantages of keeping the syringes in a solution of alcohol and glycerin. I followed that practice for a while, but discarded it as not being practical.

It has been a great treat to me to hear this paper, and I am very glad indeed to see this method kept before the profession in this way, and hope that it will be properly supported. I have used this method of anesthesia for four years, and do not see how I could practice dentistry without it. Of course, the use of this method in preference to general anesthesia is a matter of personal choice. I think there is a place for general anesthesia. Of the two methods, local anesthesia, of course, has been used for a shorter time, but if I had to give up some method, I think I would rather give up general anesthesia.

Dr. Thackston. I have had some little experience with this work under Dr. Thoma's instructions. In regard to the weakening of the needle, I did not fully comprehend how the needle should be weakened so as to break at a certain point. I do not think the needles we use are any too strong. No one should attempt injections with any other but an iridio-platinum needle, which will bend before it breaks.

In regard to injecting the solution at blood temperature, I do not see how this can be done with the instruments we use. The solution should be warm, but it is not essential to have it exactly at blood temperature. I have discarded the use of a glass jar with a metal stand, because I find that the action of the alcohol on the metal causes a sediment. I prefer a convenient flat glass tray, large enough to hold the syringe and all the appliances.

In regard to the treatment of toxic symptoms, I find six or seven drops of validol very valuable for stimulation when indicated.

Dr. Riethmüller (closing the discussion). I am delighted to see how familiar this audience is with the subject of my paper. I consider as unjust, however, the criticisms of some items in the paper, in which, owing to the brevity of the time allotted, I had to omit a great many details.

As for Dr. Thoma's suggestions regarding a reduction of the suprarenin contents in the anesthetic solution, there is nothing new in them, as he is simply following Seidel's by no means universally accepted theses. We seem to have arrived over here at the stage which local anesthesia has reached in the country of its origin, Germany, namely, the stage of hair-splitting. Instead of introducing an animus in this field of endeavor, it seems more profitable and important to improve the general routine practice, and to make these improvements accessible to the profession

at large. It was with this point in view that, six years ago, I, as the first, upon Dr. Kirk's suggestion wrote about local anesthesia with novocain and suprarenin in an American dental journal. The points of contention have been thoroughly covered by investigators like Braun, Fischer, Bünte, Moral, Williger, Seidel, and others who have for years been considered as authorities in this field. I did not consider it appropriate to annoy you with undue details and with a review of the discussions on mooted points. Enough has been done in this field to show definitely that the method of local anesthesia as described can be employed with safety and success, and will be a valuable accessory toward greater efficiency in dental practice.

I very much appreciate Dr. Jameson's remarks, especially his reference to general anesthesia. Local anesthesia was never intended to replace general anesthesia, but to supplement it. What we must guard against is a biased exclusiveness toward one method or the other, since the special indications determine the choice of the anesthetic from case to case.

In regard to the question of stimulants, which Dr. Thackston has emphasized, the immense value of camphorated validol in slight symptoms of threatening collapse is well known. A fresh solution of aromatic spirits of ammonia, strong black coffee, and in more serious cases inhalations of amyl nitrite are indicated. Immediate access to a sterile hypodermic syringe and to ampules of camphor in oil is also imperative as a precautionary measure whenever an anesthetic is employed.

Concerning the weakening of the needle, I am afraid that my critic did not grasp my thought. It is surely not a question of weakening the needle on purpose, but of locating the weakest point of the needle so that, in case of breaking, the fragment can be most easily reached. The Gates-Glidden drill is not made with the idea of weakening it or inducing it to break; this drill is made as strong as possible, but its weakest point is arranged so as to come to lie outside the root-canal, so that it can be easily removed if it should break. My critic's contention that iridio-platinum needles do not break is entirely erroneous, as many oral surgeons will attest.

I am far from insisting that the solution should be injected exactly at blood temperature, which is impracticable. I merely wished to emphasize that we should not inject a cold solution.

As for the glass jar and metal stand, I specifically remarked at quite some length that the metal stand involves the disadvantage of oxidation. For that reason I suggested the use of a glass or porcelain stand. On the other hand I think this oxidation is valuable as a danger signal, showing when it is time to renew the alcohol. Unless such a danger signal appears, some practitioners, I fear, would keep their alcohol solution for a lifetime and store up a luxuriant bacterial flora.

In concluding, allow me to state once more that my studies on novocain-suprarenin anesthesia have been activated merely by the hope that this method may become a valuable aid in routine dental practice, contributing together with other valuable anesthetic agents and methods to a saving of nervous energy to the operator, of pain to the patient, and aiding in the perfection of operative technique.

Dr. Kreppel read a letter from Dr. Cross, director of the Forsyth Dental Infirmary, extending an invitation to the members of the association to visit and inspect the infirmary.

The next order of business was the reading of a paper by Dr. Edward Kennedy, New York, N. Y., entitled "Some Hints Regarding the Manipulation of Anatomic Articulators."

[This paper was printed in full in the Dental Cosmos for November 1914, vol. lvi, p. 1228.]

Motion was made and carried to adjourn until 8 o'clock.

THURSDAY—*Evening Session.*

The meeting was called to order on Thursday evening at 8 o'clock by the president, Dr. Kinsman.

Dr. Kinsman announced as the Committee on the President's Address the following: Dr. J. H. Jackson, Burlington, Vt., Dr. F. T. Murlless, Jr., Hartford, Conn., Dr. J. E. Farnum, Providence, R. I., Dr. C. C. Patton, Boston, Mass., Dr. F. E. Maxfield, Bangor, Me.

Dr. Kinsman then introduced Dr. W. H. FITZGERALD, Hartford, Conn., who read a paper entitled "Zone Therapy."

The meeting then adjourned until the Friday afternoon session.

FRIDAY—*Afternoon Session.*

The meeting was called to order Friday afternoon at 2.30 o'clock by the president, Dr. Kinsman.

The secretary, Dr. Kreppel, read the list of applications for membership.

The next order of business was the report of the Nominating Committee, as follows:

President—G. A. Maxfield, Holyoke, Mass.
First Vice-president—A. E. Cary, Hartford, Conn.
Second Vice-president—David Manson, Burlington, Vt.
Secretary—A. A. Hunt, Hartford, Conn.
Assistant Secretary—C. F. Kreppel, Forest Hills, Mass.
Treasurer—I. B. Stilson, Providence, R. I.
Librarian—Dana W. Fellows, Portland, Me.
Editor—W. A. Young, Concord, N. H.

Dr. GAYLORD moved that the secretary be instructed to cast one ballot for the society for the election of the officers nominated by the committee. (Motion carried.)

The next order of business was a lecture, illustrated with lantern slides, by Dr. W. A. WHITE, Phelps, N. Y., on "The Method Used by the New York State Department of Health in Presenting Oral Hygiene to the Schools of the State," as follows:

The Method Used by the New York State Department of Health in Presenting Oral Hygiene to the Schools of the State.

By Dr. W. A. WHITE, Phelps, N. Y.,
Consultant and Lecturer on Oral Hygiene, New York State Dept. of Health.

Lord Bacon says, in his preface to "Maxims of the Law," "I hold every man a debtor to his profession." This maxim I believe applies to the dental as well as the legal profession, and should be recognized as a personal obligation on the part of every man associated with the practice of dentistry. The sciences and arts are a potent factor in the healing art, and with the progress of higher education we must not fail to recognize the prominent position that the dental art occupies when the health problem is under consideration. For it has become an acknowledged fact by both the medical and dental professions that there is no part of the body so closely associated with general systemic conditions as the oral cavity, therefore we are justified in saying that the mouth is the gateway to the human body. This statement is verified by reference to the following eminent members of the medical fraternity, men who are acknowledged leaders in the practice of medicine in the United States. I with pride refer to Dr. Knoff of New York City, the recognized authority on the treatment of tuberculosis, who said when addressing an audience of physicians at the Fourth International Medical Congress, held in the city of Washington, D. C., in September 1912: "I defy the most skilled physician to either help or cure a tubercular patient that has decayed teeth in the mouth." Dr. Jacobi of New York City, who is known to the medical profession as the "grand old man" in medicine, when addressing an audience at the International Mouth Hygiene Congress at Buffalo, N.Y., said, "If more attention was paid to the mouth and teeth, there would be far less sickness among both old and young." These and other eminent opinions have led many of our state departments of

health to advocate and carry into effect instructions on oral hygiene, which has now become a fixed feature of the educational system of the Health department of the State of New York, and which is conducted wholly under their direction as a distinct feature of their health work.

The method adopted and pursued with most gratifying results is through the medium of illustrated lectures, including the use of nearly one hundred slides, showing the formation, structure, and development of both the deciduous and permanent teeth, the intimate relation of the deciduous to the second or permanent teeth, with special reference to the first molar, which in the majority of cases is found missing, due to the fact that it is thought by the parents to be a "first tooth." The nerve and blood supply, together with the origin of the fifth and seventh pair of nerves, which supply the five human senses, and their direct connection with the teeth, is clearly shown, and the student taught how any one of these organs may become affected from the presence of a decayed tooth in the mouth. The serious results caused from the presence of adenoids is shown, and also the deformities of the mouth and teeth caused by thumb-sucking, special instruction being given mothers on this phase of the subject, while a prominent feature of the illustrations is the effect of neglect of the mouth and teeth—viz, failure to brush them—showing the action of the acids found in the fluids of the mouth and stomach, causing decay of food lodging beneath the teeth, and in cavities of decayed teeth, resulting in fermentation and decay, thereby stimulating and promoting the growth of disease germs, many of which are the direct cause of such diseases as typhoid fever, pneumonia, diphtheria, and worst of all, tuberculosis—all of which is illustrated and shown by the use of interesting and instructive slides. The anatomical structure of the tooth is explained, as well as the manner in which the tooth is nourished, and the cause of decay, as near as possible, is shown and explained, with the admonition that a clean tooth never decays. The proper method of brushing the teeth is demonstrated, while digestion and assimilation are fully presented, and the importance of each to the proper development of the various tissues of the body; what faulty metabolism means, the constituent elements of the food, such as the phosphates, lime salts, fats, sugars, proteins and carbohydrates, are described, and how through the medium of the blood they are distributed and assimilated while the child sleeps, with special reference to the fact that in order to have proper assimilation we must have proper digestion, and in order to have proper digestion we must be able properly to masticate our food, and in order properly to masticate our food we must have good sound teeth and a clean, healthy mouth. The manner in which these germs propagate in neglected mouths and how they become mixed with the food while eating and are carried into the stomach and in this way infect the system is called to their attention, while at the same time they are taught that the two important factors associated with the growth of germs are found in the stomach, viz, heat and moisture. The lesson of sanitation and prophylaxis is made so plain that both old and young are made acquainted with the importance of what oral hygiene means to the health of every growing boy and girl. In addition to this method of instruction, which has been confined to the schools of our cities and larger towns, a series of charts is now being prepared for use in the rural schools, covering nearly all the features above mentioned, and at the same time the New York state department of Health has under consideration the purchase of a complete portable stereopticon outfit, which will permit the regular illustrated lecture to be given in the rural sections where electrical appointments can never be hoped for, and in this way oral hygiene instructions will be general throughout the state.

Since the inauguration of this work in New York State as a part of their

health work, similar instruction has been adopted by many other states, and the indications are that in the very near future every state in the United States will have established a regular system of oral hygiene education as a part of the school curriculum.

A pleasing feature of the work is the manner in which it has been received by those in charge of our educational institutions, private as well as public, and the indorsement the movement has received from this channel has been one of its highest recommendations, and has fully convinced its advocates that it is a prominent factor in educational progress. The writer predicts that the day is not far distant when all dental schools will announce a chair in oral hygiene.

At the present time government officials have under advisement its introduction as a health feature of the army and navy, presenting it in the same manner in which it is presented in our schools, believing it to be of vital importance to the members of both departments.

The "oral hygiene" department of the New York state department of Health was established October 12, 1912, being the first state department in the United States to give official recognition to this subject. Actual work was begun in February 1913, the intervening time being devoted to preparing material for presenting the subject to the public and the schools. Since that time up to date seventy-four cities and towns have been visited, one hundred and five lectures have been delivered, and the message of oral hygiene has been preached to over 100,000 school children in New York State, with every indication that a greater number will be reached this year than during any previous year, this on account of the interest taken in the work by the dentist, the physician, and the superintendents of our schools.

Where data have been recorded, much to the surprise of all interested it has been learned that the cause of absence from school due to abnormal conditions of the mouth and teeth averages about 47 per cent., while examination of the mouths of school children reveals the actual fact that 90 per cent. need dental attention, and the failures in final examinations in our schools show that 50 per cent. are due to trouble with the mouth and teeth. These delinquents, classified as repeaters, have awakened the boards of education, and brought to their attention an important duty to such an extent that a thorough investigation of the cause of this large percentage of failures has been carried on, and as it proved to be "decayed teeth," the result has been that free dental dispensaries, in connection with the schools, have been established in all sections of the state. Nearly every school building now under construction will be provided with a complete dental equipment for the benefit of the poor boys and girls attending these respective schools who may need dental attention, which will have a tendency to obliterate much of this long-neglected condition. This will, also, as has been satisfactorily demonstrated, be the logical medium for moral, mental, and physical improvement as well as normal development, and will demonstrate to the world that scientific research work has done no greater good than in acquainting mankind with the relation that the mouth and teeth bear to the human body and its health. These facts very clearly show us that every phase of the dental art is a dominating factor in dealing with the health problem in all of life's characteristics, and guided Dr. C. H. Mayo of Rochester, Minn.—one of the most noted members of the medical profession in this country—to say, at the close of a paper read before the Chicago Dental Society, in Chicago, Ill., January 31, 1913:

> The difference between the knowledge of the layman and the medical attendant, including the dentist, should not be too great. Medical progress may be stayed from time to time that the layman may be educated to certain truths of health, that he may first know, then desire, and then demand proper health conditions. The public education by boards of health, school inspection, special committees, and the medical profession has shown what can be done with the dreaded scourge, tuberculosis.
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> All can appreciate the rapid change in

health conditions along associated lines. Nineteen million dollars were spent during the last year in this country in public instruction and care of tuberculosis alone.

It falls upon the dentist and oral surgeon to study the diseased condition of the mouth. Dental literature is full of it, and much original work has been done by such leaders as Black, Talbot, Nodine, Hartzell, Brophy and numerous others. The work is discouraging, but must be kept up, as eventually it will have its effect. The dentist's patients must be warned of the mouth as being by far the greatest portal of entrance of germ life into the body, and the most infected part of the alimentary canal. The people will gradually demand more of their medical adviser. The next great step in medical progress in the line of preventive medicine should be made by the dentists. The question is, Will they do it?

[Dr. White's lecture was discussed jointly with that of Dr. E. N. Kent, which here follows.]

The next item on the program was a lecture by Dr. E. N. Kent, Brookline, Mass., entitled "The National Mouth Hygiene Association's Lecture Dental Service," as follows:

The National Mouth Hygiene Association's Lecture Dental Service.

By Edwin N. Kent, D.M.D., Brookline, Mass.

The two main objects of the present mouth hygiene campaign are (1) the education of the public on the hygienic value of a clean mouth and sound teeth and (2) the establishment of free clinics for the benefit of those who are unable to meet the expense of needed dental treatment.

The two items are hardly comparable with reference to their importance, but those who have been active in the field seem to be coming to the belief that the logical first step in any community, among all classes of people, is education. Not only is this indicated because the spirit of the times aims toward prevention, but the dental clinic itself will not be appreciated by the average person for whom it is instituted until that person has been awakened to his needs.

It is probable that no one will question the statement that the most effective medium through which to educate the public is the illustrated lecture on mouth hygiene.

This lecture should not only present the facts, but should present them in such form that the interest of the audience will be excited and held for thirty minutes. This is no easy task, as most of those who face the lecturer are not particularly interested. They may attend the lecture because they think it their duty, or because mother or teacher compelled them to, but most of them would prefer the movies, and it is up to the speaker to try, at least, to make them glad they came.

The preparation of a thirty minutes' talk to meet the requirements necessitates an expense of time and money which the average dentist does not feel he can invest in the work, even though he may possess the talent and knowledge necessary for its accomplishment.

The problem has been successfully solved in some communities by the appointment of lecturers who have been selected with due regard to the special qualifications required, the remuneration for their services being supplied by town or state appropriations. Such a system is perhaps in many ways ideal, but there are eighty-odd millions of people in the United States who need to hear the gospel of mouth hygiene, and no one will deny that, before such a scheme could be extended far enough to place our sermon within reach of them all, the children's grandchildren's children of the present generation would have passed on to a better world.

Not every dentist has the ability, the time, or the money to prepare and present such a lecture as will set forth the subject in proper form, but in nearly every community where lectures are needed—which means every community which has not already been covered—there is someone who may be interested in the work who can supply a speaking voice. On this proposition the National Mouth Hygiene Association bases its present attempt to solve the problem in a large and extensive way. We are pre-

paring a series of illustrated lectures on mouth hygiene suited for various types of audiences, the manuscript and slides for which will be loaned to dentists, physicians, nurses, and others who may be considered as fitted to present the matter to the public, at a rental fee of one dollar per use.

A dentist who desires to make use of the service will remit one dollar together with an application blank properly filled out, giving the type of lecture wanted, with reference to age of auditors, etc., and the date on which it is to be given. Several days before the date of the lecture the applicant will receive manuscript and slides, the latter packed in a carrying case, in just the sequence in which they are to be projected on the screen.

The whole matter is so carefully systematized that even the addressed tag for return shipment is inclosed in the box, and we believe that the service we offer makes the production of a lecture so easy of accomplishment that any dentist in any section of the country may furnish his people with the lecture service they need at an expense so small that it is hardly worth mentioning. And we believe further that the service will extend the lecture field and thus the education of the public to an extent which no other scheme yet advanced seems to promise.

The first lecture of the series—the only number now ready for distribution—a thirty-minute talk on "The Care and Use of the Human Mouth," for adult audiences, which we believe will fill about nine-tenths of the demand, I will present for your approval.

Dr. Kent followed his paper by the reading of a prepared lecture such as was proposed to be furnished to various dental societies and organizations throughout the country by the National Mouth Hygiene Association.

Discussion of Dr. White's and Dr. Kent's lectures.

Dr. Harold DeWitt Cross, Boston, Mass. Everyone has been much interested in the two papers just read, and while they differ somewhat as to the means to be employed, they are both seeking the same end, namely, the education of the public in the value of mouth hygiene.

The methods adopted by Dr. White are excellent, and must be productive of great results; he is fortunate in having the opportunity and the facilities at his command to take up such a work. The lectures are so arranged as to be not only interesting but instructive, and they have the great advantage of creating interest without being irksome to the child; in fact, lessons are brought to the child's attention without his knowledge, so to speak, and nothing but commendation can be accorded to the system of lecture courses which are given systematically in all the schools of the state.

In regard to the uniform "extension course" of the National Mouth Hygiene Association, I believe that all will agree that the idea and the way in which it has been developed does credit to its originator, and that untold good will result from Dr. Kent's systematic efforts. The usefulness of this system, by which the masses may be reached, depends only upon the number who may wish to take up the work; and any dentist, no matter how busy, or anyone interested in mouth hygiene has only to ask, to have a complete, ready-made illustrated lecture and all the facilities for carrying it out placed in his hands. This makes the process so easy that I believe as soon as the plan becomes known, the extension course of lectures will be one of the most efficient means of showing the advantages of mouth hygiene.

As to the question of how best to present the subject of mouth hygiene to those needing it, many plans have been advanced, as in all reforms; and perhaps this is best, as, while one or another is being tried out, the whole subject is becoming more widely known, and eventually the best line or lines of work will be determined.

Dr. Kent said that the objects of the mouth hygiene campaign are—(1)

the education of the public in the hygienic value of a clean mouth, and (2) the establishment of free dental clinics for the benefit of those unable to meet the necessary expense of treatment. And to accomplish these two objects Dr. Ebersole says, "The plan of the National Mouth Hygiene Association is to employ the four great educational institutions, public school, public press, public platform, and the motion picture; and the greatest of these is the public school." Dr. Rauh, in his excellent article some time ago, said, "Education, inspection, and free clinics must be utilized all together, each dovetailing into the other in importance." And both of the essayists today have indicated that the vital point in the work is the school.

The following are some of the means which have been suggested for impressing on the people the need for mouth hygiene:

(1) Dental inspection by a physician, dentist, or dental nurse in schools. Inspection is good if the inspector, whoever he may be, has time to talk and advise with the child—for the inspection falls far short of its greatest advantage if the main object consists merely in making a chart of the defects of the teeth. One of the main objects of the inspection ought to be the education of the parents through the child, so as to gain their co-operation, and this is perhaps the most potent means of educating the masses.

(2) Lectures, illustrated as much as possible, are, even when outlined and presented by a person familiar with the subject and one who appreciates the psychological aspect, as Dr. Kent has said, "no easy task" to arrange and to present so as to stimulate sufficient interest to get the people to attend and to listen understandingly. Interest must be created beforehand in some way, in order to reach those who most need the knowledge of mouth hygiene. There must be a reason for their interest more than that someone wants them to be interested.

(3) Moving pictures which may be used to teach an object lesson, or may show directly methods of brushing teeth, etc. We have today seen a demonstration of the possibilities in this direction, and it seems as if these pictures would create interest in any child or even in their parents. With the interest in movies in general, the possibilities of object lessons are very great. While an entire roomful of people can see a moving-picture demonstration of the manner of brushing the teeth, an actual demonstration by an individual before them could be taken in by but very few.

(4) Compulsory dentistry either by direction of the board of health or by requiring, as has been done in one school at least, the certificate of the dental examiner for admittance. Dr. Eugene H. Porter, former state health officer of New York state, says—"I believe thoroughly that it is the duty of health authorities to compel all citizens under their jurisdictions to cultivate habits of health, and to punish all who persistently refuse to acquire those habits so far as the evils of neglect are in any sense a danger and a menace to the community. And one of the unlimited educational possibilities of health boards consists in their privilege to point out repeatedly and cumulatively the industrial and community benefits which result from habits of health, and the industrial and community losses which result from habits of unhealthy living. And should it be thought that this health program encroaches upon the individual liberty, we may recall what one of the greatest of modern biologists has recently said—'As we march onward toward the true goal of existence, mankind will lose much of its liberty, but in return will gain a high measure of solidarity. The more exact and precise a science becomes, the less freedom we have to neglect its lessons.'" These new duties are before us, and it is only by organized, enlightened, and persistent effort that we may hope to accomplish our ends.

(5) Free clinics, with some inducement to receive the service. Many persons do not take the same advantage of dental clinics as of other surgical and medical ones, for except with an aching

tooth they can get along without dental treatment. The dental clinic, therefore, should do more than provide a place where treatment may be obtained; it should offer some inducements to treatment, either in the matter of providing it free or at a very nominal cost, even to those who could afford to pay something—*in order to stimulate interest in mouth hygiene.* Individuals or classes may be selected from schools or communities to serve as demonstrations after their mouths have been put in order, and will show to their parents, playmates, and neighbors the advantages of clean mouths, much as a settlement worker demonstrates in the homes. Perhaps this plan might serve to stimulate enough interest in a community to give a lecturer an appreciative audience. This was well illustrated by the experimental class of the Marion school.

(6) Tooth-brushes and powder either free or at cost are proving a good incentive toward clean mouths, and the custom should be more commonly adopted.

(7) Tooth-brushing drills in schools may result in much good if properly carried out as to instruction and as to aseptic precautions, but the dental clinic is possibly a better place for such instruction, as it can be more personal, and more aseptically performed. These drills have, however, been taken up to advantage in some of the missionary schools in foreign countries.

(8) Instruction in mouth hygiene by physician and nurse during sickness, to those who in health do not practice it, has been advocated as a means of bringing home the advantages of mouth hygiene, but this, of course, reaches only a comparatively few.

(9) Observations by all teachers of the general mouth conditions of their pupils, from which observations they may be referred to clinics for treatment; also teaching mouth hygiene in connection with allied subjects.

In these remarks I have endeavored to give you some quotations from those familiar with the actual work of promulgating the doctrine of mouth hygiene. From these we may learn that there are many ways in which interest may be created in mouth hygiene, and that there may be some good in each; and until more progress is made, it behooves everyone interested to work along some line. The dentist's first duty is perhaps to interest public officials, school boards, boards of health, and others in authority, but also to do his little part in actual work or to help finance another in such work. The increase in the number of cities having dental inspection in their schools and of cities providing free dental clinics shows the wonderful advancement of the mouth hygiene movement, which was inaugurated only a few years ago.

Dr. S. A. Hopkins, Boston, Mass. I think the State of New York is to be congratulated on having a man to present this subject in such an intelligent and enthusiastic way. I think that if we had a few hundred men like Dr. White to travel around the country and give these lectures on oral hygiene to the children, every dentist in the land would be driven in ten years to the brink of starvation; there would be no more caries. I certainly feel that the work has to be done through the children. First, we must get the children interested, and then we may hope to educate through them the parents.

I want to comment on one statement by Dr. White. I do not think that he meant to convey the idea, which perhaps some received, in reference to the possibility of there being a hundred germs of disease in the mouth. As a matter of fact there are not a hundred germs of human diseases in existence. The number is much less than that, and though almost every germ may be found at some time in the human mouth, we would not find them all together at any one time; nevertheless, there are many that are indigenous to the mouth.

Another thing I think we should recognize is that, while the unclean mouth and teeth are sources of infection, and the danger cannot be overestimated, it should not be forgotten that the tonsils may be a source of infection, and that

even a clean mouth, provided the tonsils are diseased, may still present a serious source of danger. Ten years ago I read a paper before the meeting of the American Medical Association in Boston, on the pneumococcus, and I called attention to the fact that the pneumococcus was found in the human mouth, and nowhere else except in the mouth, and that it was indigenous to the mouth. I said that all the talk about pneumonia germs floating in the air of hospitals was not well founded, and that, if surgeons had the mouth of the patient put in order before an operation was performed, there would be no such thing as ether pneumonia. Another thing I mentioned was that, by actual experimentation in the laboratory, I found—as everybody knows who is familiar with the cultivation of pneumococcus—that it is a very weak germ in the sense that it is very easily destroyed by weak solutions of antiseptics, and that it does not flourish or thrive unless the conditions are proper for its growth. If this were not true, we would all be dead, because the germ is in the mouths of half the people in this room at the present time. When proper conditions are present, it will take up its work.

In this connection I want to call attention to a paragraph in Dr. Kent's paper, in which he mentions a number of diseases which are transmitted from mouth to mouth. Two of these diseases that he mentions should be omitted, for we are not quite sure today whether they are germ diseases or not. It is probably true that they are, but we should be careful in making statements unless we can back them up with scientific proof.

I have been associated with Dr. Kent in the Dental Hygiene Council in Boston, and I know what a worker he is; I am afraid that if it were not for him, the Hygiene Council would not be a very active body. As it is, however, we have done a great deal of work in this state, and I want to say here that the first dental oral hygiene convention that was held in this country was held in Boston some years ago. At that convention one of the speakers read these few verses, which I think sum up the present situation very well:

Fence or Ambulance?

'T was a dangerous cliff, as they freely confessed,
Though to walk near its crest was so pleasant;
But over its terrible edge there had slipped
A duke, and full many a peasant.
So the people said something would have to be done,
But their projects did not at all tally:
Some said, "Put a fence 'round the edge of the cliff;"
Some, "An ambulance down in the valley."

But the cry for the ambulance carried the day,
For it spread through the neighboring city.
A fence may be useful or not, it is true,
But each heart became brimful of pity
For those who slipped over that dangerous cliff;
And the dwellers in highway and alley
Gave pounds or gave pence, not to put up a fence,
But an ambulance down in the valley.

"For the cliff is all right if you 're careful," they said,
"And if folks even slip and are dropping,
It isn't the slipping that hurts them so much
As the shock down below when they're stopping."
So day after day, as those mishaps occurred,
Quick forth would these rescuers sally
To pick up the victims who fell off the cliff,
With the ambulance down in the valley.

Then an old sage remarked, "It's a marvel to me
That people give far more attention
To repairing results than to stopping the cause,
When they'd much better aim at prevention.
Let us stop at its source all this mischief," cried he,
"Come, neighbors and friends, let us rally!
If the cliff we will fence we might almost dispense
With the ambulance down in the valley."

"Oh, he 's a fanatic," the others rejoined,
"Dispense with the ambulance? Never!
He 'd dispense with all charities, too, if he could!
No, no! We'll support them forever!

Aren't we picking folks up just as fast as they fall?
And shall this man dictate to us? Shall he?
Why should people of sense stop to put up a fence
While their ambulance works in the valley?"

But a sensible few, who are practical too,
Will not bear with such nonsense much longer;
They believe that prevention is better than cure,
And their party will soon be the stronger.
Encourage them, then, with your purse, voice, and pen,
And (while other philanthropists dally)
They will scorn all pretense, and put a stout fence
On the cliff that hangs over the valley.

Better guide well the young than reclaim them when old,
For the voice of true wisdom is calling:
"To rescue the fallen is good, but 't is best
To prevent other people from falling.
Better close up the source of temptation and crime
Than deliver from dungeon or galley;
Better put a strong fence 'round the top of the cliff,
Than an ambulance down in the valley."

JOSEPH MALINES.

(From *Two States*, journal of the Y. M. C. A. of Massachusetts and Rhode Island.)

Dr. HORACE L. HOWE, Boston. I think New York State is very fortunate, as Dr. Hopkins and the other gentlemen have said, in having the services of one so competent to preach the gospel of oral hygiene. I think the poem cited by Dr. Hopkins covered the situation very well. Not all states recognize the importance of oral hygiene as New York seems to. All the conditions must be met by different means, and I think Dr. Kent's plan of meeting the different conditions is unique. A man unfit to lecture might present the subject in a very incompetent way, and I think we should all give our support to his plan. Everyone can help in his own way, and it is up to each of us to help in whatever way we can.

Dr. G. A. MAXFIELD, Holyoke, Mass. I am very sorry that we have no such men as Dr. White to go through the schools in the cities and towns in Massachusetts to present this subject. There is one thing that deters Massachusetts from taking up this line of work, and that is our increased taxation. If you stop to think how the state, county, city and town taxes have increased in the past few years, and probably will keep on increasing, you will readily see why it is difficult to get anything of this sort started in our schools. There is something being done throughout Massachusetts, Connecticut, and other states by the Colgate Co. Their agent, who is here with the exhibition today, has been to Holyoke, and he tells me that he will go to Westfield next week, and probably to all the towns in the state. He told me of his having been in Hartford and how much encouragement he received there from the Hartford Dental Society. He goes into the schools and gives lectures on the care of the mouth to the children, and tries to impress on them the necessity of a clean mouth, and says nothing in regard to the Colgate Co. In some schools he gives out samples in the same way as these are given to various dentists in the country. We appreciate very much what the Colgate Co. have done; I do not know whether we will ever have this work done in Massachusetts in the way in which it is done in New York, but I do wish that the young men throughout the state would be willing to take up the work. In my own city a few years ago the superintendent of schools inquired from me if we could not establish a free dental clinic in Holyoke, and that a room in one of the new school buildings could be secured for this purpose, if we would take it up. My health was in such a condition at that time that it was impossible for me to take the matter up, but I told him that doubtless some of the young men in the profession would be willing to do this. Two of the young men went around among the dentists of the city, but they did not find one colleague who was willing to give his time or a portion of his time to such work. That is all the encouragement we received, and therefore the plan was given up. This is a

work that is very necessary to the public, and I am hoping that the benefits of the Forsyth Infirmary will not be confined strictly to Boston and vicinity, but that they will be able to prepare lectures and perhaps lecturers to be sent out over the state, so that some of us besides Boston might derive some benefit from this great benefaction.

Dr. James McManus, Hartford, Conn. I am very glad indeed that Dr. Maxfield referred to the matter of taxation, etc. That is one point which, when understood by the public at large, will make them favor all that Dr. White has said, because just as sure as the child is brought up right and in such a way as to make him healthy, the less likely is he later to become a charge on the town or city, and the fewer invalids, diseased people in hospitals, and poor broken-down people unable to work will we have to support. The health of our children is the greatest aid to good citizenship and reduces to a minimum the likelihood of their becoming an expense to the community, as all unhealthy people are more or less.

I am glad that Dr. Maxfield called attention to the work of the Colgate Co. They have gone about their work quietly, unostentatiously, without pushing their cause, but very forcibly impressing upon the children in the schools the importance of oral hygiene. They have done this in all the schools in our city with the exception of one district, and it is in the so-called rich district, where they are not wanted. My experience, however, is that among educated and rich people we find quite as much need for dental instruction as among the poor people. I appreciate very much the valuable work Dr. White has been doing, and I have been very much interested in it since he first began it.

There is one point to be borne in mind in regard to this work, and that is, we cannot hope to teach the present generation very much; they are too old to take it up. We cannot teach the medical men, and I was going to say the dentist, much in the matter of mouth cleanliness, but I think every dentist here who has had physicians as patients has found the mouths of physicians in quite as filthy a condition as we find the mouths of ordinary civilians, and yet these physicians have been taught all their lifetime the necessity for having clean mouths and bodies. Therefore, to my mind, the best method of getting results in this direction is through the school teachers. The "school-marm" has more influence, can do more good, than any other class. She can send the child home if he comes to school with dirty shoes, face, and hands, and a child does not like to be sent home because of a dirty face. For this reason the teacher can have a great influence in teaching the children to have clean mouths, and if you interest the teachers, you will find the result to be that they are doing an immense amount of good. They are teaching the children, and the way to teach the parents is through the children. They go home and tell the parents, and the parents who have been neglectful become interested in having the children in as good a condition as are those of their neighbors, and follow the advice that the teacher gives in regard to the mouth and teeth.

Dr. Edward Kennedy, New York. I have been very much interested in the work that the State of Massachusetts has been doing along different lines. We realize that by organization the greatest benefit is to be gained for the profession. We can attain a great deal more by organization than we can by individual effort. You in Massachusetts have had a great deal of trouble with the gipsy moth, and you have spent thousands of dollars in ridding the state of it, all of which could have been saved if the movement had been started earlier. The objection has been raised that the state is too poor to take up this work. I have always thought Massachusetts to be one of the richest states in the Union, and there is no reason why they cannot do this work if they go at it in the proper manner. An interesting sidelight in this connection is the work which is being done in this state in other lines. Look at the amount of

work done, and the good accomplished by one man in the matter of pure food! If it is necessary to have pure food, it is certainly as necessary to have perfect organs to chew that food with, and I feel that the dentists can do a great deal of good in this direction, if they will go at it in an organized way. One of the speakers spoke of teaching children. I remember when I was in the University of Pennsylvania, Dr. Kirk used to conduct a Bible class, and a well-attended one too, and on one occasion I remember that he explained to us the meaning of the parable of "Old Wine in New Bottles," which he has since more elaborately dwelt upon in an editorial. In this connection he said that, when he started out to teach dentistry, he tried to teach the profession, but he found that to be a hopeless task. He compared this to the parable of putting new wine in old skins which were liable to burst and spill the wine, rather than putting new wine into new bottles to be preserved. I think that is a very interesting parable, and can be applied here.

Another thought in connection with the importance of keeping the mouth in a healthy condition. Dr. Dorrance of Philadelphia, who has done a great work in research, found that in cases of tubercular glands of the neck, which were pronounced operable, the simple placing of the mouth in a healthy condition saved eighty per cent. from operation. These are facts that the medical men should understand.

I feel that this work should be carried on by thorough organization, and not by the individual dentist. If we can get together and carry on this work as a society, we can certainly accomplish a great deal. Some men bring forth the argument that when everybody has clean teeth, there will be no work for the dentist. Dr. Truman has shown that, if every dentist worked eight hours a day, every day in the year, we could not take care of more than one-tenth of the inhabitants of the United States, Canada, and Mexico in a year. So we have a great field before us, and there is no doubt that we should carry on the work with greater vigor.

Dr. Newton Morgan, Springfield, Mass. I fancy that I must be what may be politically spoken of as a conservative-progressive. I have seen a good deal of this idea of educating school children and young people in prophylaxis, and for the last four or five years I have been rather conservative in regard to it. I have been in full sympathy with the objects to be attained, but I feel that we should go slowly, and feel our way along, and take the steps *practically* as we take them. I feel that we are working along the right line, but we must try to keep a level head all along the way. All these children have a parentage to deal with, and we do not know the trouble and suffering that these children have endured as an inheritance. As to the care of the teeth, I was intimately acquainted with Dr. Riggs, and had many talks with him along this line, and through all these years his influence has been one of the greatest factors in regard to the hygiene of the mouth, prophylaxis, and care of the teeth. I have tried to follow his teachings in a practical way. I have said to my patients that it was all very well to brush their teeth four or five times a day, but there was one time especially when the teeth should be brushed clean, and that is before retiring. The average individual may brush his teeth two or three times a day, and then at night miss the most important time, because he is too tired. So I question if it would not be more desirable that the teeth be cleaned *thoroughly* once a day, and that at bedtime; this would be better than doing it indifferently four or five times a day.

In regard to the lack of care of physicians' mouths, we have heard that all our lives, but I wonder how many in this audience of dentists could answer in the affirmative if the question was asked if they had brushed their teeth three or four times or even once, or if they have used the floss silk for cleansing the teeth within the last twenty-four hours.

Dr. A. J. Flanagan, Springfield, Mass. The question has been raised as to the practical benefit of these papers. I want to take a few minutes to sum up the conditions in Massachusetts, and in doing so I sum up the conditions that exist in all of these New England states. The statement has been made as to the lack of appreciation of the public, but the trouble lies not with the people, it lies with the dentists themselves. For twenty years I have been on a hospital staff on which four dentists have been regularly appointed to represent dentistry. During these twenty years, lectures on dentistry have been given to the nurses' class, chiefly by one man, while the other three members on the staff delivered only two or three. That is selfishness; these men want the position, but they do not want to deliver the service. Take the hundreds of hospitals over the country; they have courses to teach the nurses, and the nurses follow these teachings when they go out into service. How many of these have courses of lectures in regard to the care of the teeth, and why? I know that physicians would be glad to extend privileges in this direction. Think of this opportunity to preach oral hygiene in a practical way, and of the power for the elevation of the standing of dentistry! Invitations have been extended broadcast in this state to dentists to read papers, to serve on committees, and do all kinds of routine work to perfect these organizations, but when they are asked to do such work, they claim they are too busy, that their practice is so large they cannot give the time, etc. I maintain that such practical lectures and talks as we have had at this meeting are of great worth, and I want especially to thank Dr. White and Dr. Kent for coming here and giving us these lectures.

Dr. E. S. Gaylord, New Haven, Conn. I want to cite one case as illustrating the result of some grain which fell on good ground. A little woman in New Haven two years ago married one of the directors of an institution which cared for orphan children. When Dr. White was in New Haven, she heard his lecture, and from this she realized the value of oral hygiene, if it could be put into effect in that institution. She proceeded to put this thought into practice, and had these children, one hundred and twenty-six, I think, brush their teeth twice daily. The result was so impressive to her that she invited me to examine their mouths. I was so impressed that I took occasion to invite Dr. Fones to examine these children with me, and Dr. Fones said he had never dreamed that such results could possibly be obtained in a little less than two years. When I tell you further that Dr. Campbell assures me that ninety per cent. of the ordinary diseases of children, such as mumps, measles, etc., have been eliminated from that hospital during her administration, it shows what this work means.

Dr. C. B. Pierce, Worcester, Mass. I advise my patients in using the toothbrush to have more than one brush, so that a perfectly dry brush may be available at all times. I tell them that the brush does not do its work effectively when it is waterlogged.

Dr. White (closing the discussion of his paper). In closing I want to give you some idea of how I became interested in this work. For ten years I served as a member of the Oral Hygiene Committee of the National Dental Association and also of the National Mouth Hygiene Association, and gave the subject of oral hygiene special study, particularly in regard to the manner in which the work is carried on in Europe. Learning that Europe was far ahead of the United States in instructing children on the subject of oral hygiene, and realizing what it means to the health of our children, I resolved to do all that I could to advance the cause. Serving with Dr. Ebersole, whom many of you know, I learned much from my associates. I was a member of the committee when the moving pictures were designed and selected, but I was the only member of the committee who opposed the pictures. I opposed them for the reason that I did not think the educational feature of the moving pictures as pre-

sented by the National Hygiene Committee was what is should be; but since the presentation of the pictures, the Oral Hygiene Committee of the New York State Dental Society have produced a picture which I think is one of the most instructive lessons I have ever seen. This picture was shown at the Rochester meeting of the National Dental Association this year. My experience with the moving pictures has been limited, as I devote myself to the slides and charts which I showed this afternoon.

In regard to being able to present this subject before the school children of your state, I believe you are as able to do this as the state of New York, and in regard to having this work inaugurated in this state, I want to give you the benefit of my experience. Do not undertake to have it presented in the name of a dental society, because people will accuse you of trying to advance your own cause. I labored for two years in the Health department of New York State without the knowledge of any other dentist in the state, because, if my efforts failed, I might have been told, "I told you so;" but if they succeeded, my colleagues might have congratulated the Health department and the dental profession. If you have a health commission, take the matter up with them; use your influence with all the members of the legislature, and if you have enough members who indorse your effort, take it up with the governor. The greatest encouragement we received was from Governor Sulzer. He said he would render us all the assistance possible, as he wanted the work carried on as extensively as it could be done. As a rule, my work has been devoted to cities and towns; at the same time we have constantly appealed to the rural districts. In this connection I conceived the idea of getting up an outfit for giving these lectures in districts where the electrical equipment is not as good as in the cities. When the matter was presented to Dr. Porter, then commissioner of health, he told us to go ahead with it, but unfortunately, since then, political conditions have arisen that left the work without support.

In regard to the number of germs found in the mouth, I want to say that my experience in the laboratory and with the microscope is very limited, and in making that statement I quoted Dr. Netter, one of the most skilled bacteriologists in the United States, and it was from him that I learned that there are more than one hundred varieties of disease germs that grow in the mouth.

In regard to school work, I believe that the school is the proper place to conduct this work. Dr. Wiley, in addressing an audience in Rochester, said that the most valuable asset of the United States is its children. He knows, as you and I know, that the future of this country depends on the physical and mental development of the boys and girls of today, and while it is not possible to change the habits of the older people with regard to the care of the mouth and teeth, I believe that, if we educate the boys and girls along the lines of oral hygiene and instruct them as to its value in regard to health, we will have in the future a stronger and better race of citizens.

Dr. KENT (closing the discussion on his paper). I came here with no new theories, but simply with the desire to exhibit a scheme which I submit for your approval.

Dr. Flanagan spoke of taking up this work with nurses. This lecture is but the start of the work which we are attempting in the National Association. Lecture "A," the one I presented today, is now ready, and these other subjects will follow in course of time.

I would also say a word in support of the statement made by Dr. White, who acknowledged that it would be a mistake to present this subject indiscriminately through dental societies. This lecture was originally written by me, but was not approved for publication until it had been presented twice before the Hygiene Council, and generously criticized and corrected. I believe it is a mistake for men to go out and try to

present this matter before public audiences unless they are well prepared. That is the reason for these lectures; there is no statement made in them that does not come from an authentic source.

The next order of business was the reading of a paper by Dr. F. K. Ream, New York, entitled "Simplified Surgical Technique Employed in Root Resections for the Radical Cure of Chronic Dento-Alveolar Abscess."

[Dr. Ream's paper was published in full at page 396 of the issue of the Dental Cosmos for April.]

At the Saturday morning session the chief business was the installation of the newly elected officers, after which the association adjourned until the next annual session.

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

Regular Monthly Meeting, held April 27, 1915.

The regular monthy meeting of the Academy of Stomatology of Philadelphia was held Tuesday, April 27, 1915, in the assembly room of the College of Physicians, Philadelphia.

The meeting was called to order at 8 o'clock by the president, Dr. J. C. Curry.

The first item on the program was the reading of a paper by Dr. T. D. Casto, Philadelphia, entitled "Blood Changes Produced by Nitrous Oxid and Oxygen Anesthesia in Both Man and Lower Animals."

[This paper is printed in full at page 881 of the present issue of the Cosmos.]

Discussion.

Dr. G. C. Küsel. Concerning the changes in hemoglobin shown by spectrum analysis, it occurred to me that the reduction in hemoglobin might be due to the lack of oxygen supply to the blood during nitrous oxid anesthesia.

Dr. R. H. Riethmüller. What appeals to us so much in connection with this subject is the fact that progressive research work is now being done in a field which has heretofore been rather obscure. The actual processes occurring in a patient during the analgesic or anesthetic state have been more or less wrapped in mystery. General statements, of course, have been made as to the agency by which ether, chloroform, and nitrous oxid produce anesthesia, but what actual changes are going on has heretofore not been satisfactorily explained. The academy is, therefore, to be congratulated that these painstaking studies have been made in our midst and with results which have been so favorable in regard to establishing a fact which within recent years has been doubted, much to the disadvantage of this wonderfully advantageous method, that is, the wonderful safety of nitrous oxid anesthesia. The profession is further to be congratulated on the fact that interest in analgesia by nitrous oxid and oxygen is being awakened again, after it had received quite a little setback owing to the fact that a great many practitioners, who had learned what they knew about analgesia from a few superficial demonstrations merely, had become disgusted with their own inefficiency after a few trials.

On the other hand, I can only again emphasize that it is necessary to select cases according to their individual requirements, and not to stick to one method as a routine, and to apply it

indiscriminately for everything and anything.

Dr. Casto (closing the discussion). Dr. Küsel's suggestion as to the change in hemoglobin may be entirely correct, but the loss of hemoglobin which we have observed is always constant, and possibly can be accounted for by the reduced number of erythrocytes present in nearly every instance during analgesia or anesthesia. The investigation of this subject is full of interest, and has only commenced, as we must look more carefully into the changes in the leucocytes and red blood cells. Evidently some change occurs which microscopists have not as yet discovered. Personally, I am not quite satisfied as yet with regard to our findings in connection with the red blood cells. In conclusion, I have only to say that nitrous oxid and oxygen has been an excellent servant of mine, and I hope to continue its use.

The next paper on the program was that by Dr. Wm. R. Butt, entitled "The Nose, Throat, and Ear as Neighboring Organs to the Teeth."

[This paper is printed in full at page 837 of the present issue of the Cosmos.]

The next item on the program was a paper by Dr. A. P. Lee, entitled "The Securing and Maintaining of Asepsis During Canal Operations."

[This paper is printed in full at page 859 of the present issue of the Cosmos.]

Discussion.

Dr. O. E. Inglis. Recognizing the great difficulty of securing asepsis, I resort to the antiseptic method to supplement other efforts. In working about root-canals, for example, I paint the filling or top covering with tincture of iodin, and after entering a tooth in which I am liable to induce infection, I resort to the use of formocresol and work under its influence, unless I am using acids that are germicides. I have felt that this is a safe method of not only keeping bacteria out, but killing those introduced by carelessness, and I find that it works out very nicely.

Dr. Dudley Guilford. I recognized some years ago that one of the weakest phases of root-canal operations was the handling of the cotton which we wrap on Swiss broaches, and I have found the following method very satisfactory: Small bits of aseptic cotton are wound on a number of broaches. These are put in a glass dish and placed in the formaldehyd sterilizer, where they are kept until needed. In this way, the broaches and cotton are always sterile. I arrange it so that the broaches shall have been in the sterilizer at least ten hours before they are used, so that I am sure they are completely sterilized. I have found this to be a very satisfactory method for having sterile broaches wrapped with cotton ready for use, and in this way I avoid infecting a sterile root-canal by placing in it cotton which has been contaminated by contact with the hands.

Dr. Küsel. Dr. Lee spoke of dentists not having autoclaves. I would suggest that the ordinary vulcanizer would make a very good autoclave.

Dr. Riethmüller. As Dr. Lee asks for suggestions with regard to antiseptics, I would suggest that liquid vaselin or paraffin is an ideal medium for sterilizing any sort of instruments. In addition to its value as a sterilizing medium, it will prevent oxidation of the instruments. It has been demonstrated that no bacteria will live in liquid vaselin or paraffin. There is only one vegetable fungus that grows on the surface of liquid vaselin or paraffin, and that is harmless. In abdominal surgery liquid vaselin is used extensively, and I think its use is especially suitable for delicate instruments such as broaches.

The asepsis which Dr. Lee refers to in regard to instruments as they come from the manufacturer is purely incidental. The manufacturer does not claim to furnish aseptic instruments: quality of instruments, not asepsis, is his aim, for the simple touch of the hand defeats asepsis. The aseptic condition of instruments which Dr. Lee has demonstrated is due to the fact that vaselin or some mineral oil is placed on the in-

struments to preserve them from oxidation, and they are therefore in a more or less aseptic condition when purchased.

Lysol is extremely disagreeable to some patients because of its odor, and I should prefer a seventy per cent. solution of alcohol, which has the same antiseptic power as lysol, is not proprietary, does not precipitate or coagulate, and is far more pleasant to the eye and to the olfactory organs.

Dr. Küsel. I would like to ask Dr. Lee whether in his investigations, regarding the asepsis of instruments, he made anaerobic cultures as well as aerobic cultures?

Dr. Riethmüller. I might add that neither anaerobic nor aerobic bacteria thrive in liquid vaselin. To all root-canal work, the following motto applies best: "It is not so much what we put into a root-canal, but how we put it in." There is no question that asepsis is absolutely necessary for successful root-canal work.

"Aseptic" paper or cotton points—which, of course, we cannot in fairness expect to be aseptic without previous sterilization—I have found a very convenient accessory for drying and medicating root-canals. They can be employed without being touched with the fingers, thus avoiding a break in the delicate chain of asepsis.

Dr. J. H. Gaskill. It seems to me impossible to keep root-canal filling instruments absolutely sterile for the length of time which we are using them, because they are so apt to become contaminated in our work, and it has been my practice to keep my instruments antiseptic by having them saturated with creasote. During the operation my effort has been directed toward providing antiseptic conditions as well as aseptic conditions. The last act of the operation prior to filling a root-canal consists in saturating the canal with eucalyptol, which is a mild antiseptic and a solvent of gutta-percha. This is an antiseptic, the gutta-percha point also having been made antiseptic, so that I feel fairly sure of the aseptic character of my work.

Dr. Lee (closing the discussion). I am glad that the discussion of my essay has been so general, because it indicates that we are all vitally interested in this subject. Several points have been brought out which I think especially valuable in supplementing my work.

Dr. Inglis says he is endeavoring to produce antiseptic conditions. We all do that, but, as I have stated, it was not the purpose of my paper to discuss to any extent the use of drugs in the treatment of canals for sterilizing purposes, because, if we can produce aseptic conditions, we still have, in our antiseptics another loophole of escape in case of trouble. As I said further on in the paper, we are fortunate in having conditions in which we may use powerful drugs—drugs that may not be used by the surgeon. When we watch the technique of some operators, we are disposed to wonder why every tooth they treat does not abscess. I have been in offices where there was little evidence of any attempt at sterilization; the instruments were sometimes passed through a steam sterilizer once a day, but with no real knowledge of asepsis, and dependence was apparently placed wholly on powerfully antiseptic drugs. I believe in using such drugs, but we should not depend entirely on them.

Dr. Guilford's suggestion was an excellent one, and is in line with what I spoke of in regard to Miller's experiments. If the instruments are allowed to remain in the formaldehyd sterilizer only a few hours I believe no injury would come to them; in fact, I am not sure whether the means of sterilization used by Miller was formaldehyd, because he alluded to the fact that the instruments became brittle, and he finally decided to give it up.

I wish to thank Dr. Riethmüller for his suggestion as to the use of liquid vaselin or paraffin as a medium not only for the sterilization of materials but for keeping instruments in aseptic condition after having sterilized them. In reference to lysol being objectionable to the olfactory sense of patients, I use it in such small quantities, and in tubes that

are not brought near the patient's face, that I question whether any of my patients know what material I am using. It is quite likely that there are other materials as good, but I began using this agent and have retained it, following Lincoln's advice "not to swap horses while crossing the stream." As to paper points, I use them to some extent, and they are very good if the canal be large enough, but many canals are smaller than the smallest point, and so it jams before it is inserted half-way into the canal, and then, of course, crumples up. Frequently, in lingual canals of upper molars and in distal canals of lower molars the paper points are very serviceable.

Dr. Küsel asks about the tests that were made. I do not recall at the present time the minutiæ that Dr. Gildersleeve and I went into, but I remember that the medium used was agar. We selected a cleanser from each package of products of as many manufacturers as we could get, and on but one or two of these did we find any bacterial growth. This finding was a surprise to me, but, as Dr. Riethmüller says, it is quite likely that the manufacturer should not receive any special credit for this, as he simply employs a process to prevent rusting.

Dr. Gaskill spoke of using antiseptics rather than following out the large amount of detail required in asepsis, mentioning his preference for eucalyptol. I have never used eucalyptol for this purpose. I realize of course that in eucalyptol we have an antiseptic of some value, and in connection with gutta-percha in root-canal fillings I believe it represents a fairly good, but not powerful, antiseptic. It is at least a very safe one, and is not productive of any irritation. However, if we are going to use any agent of that sort I would rather fall back on Dr. Inglis' suggestion, namely, tincture of iodin. This is one of the best antiseptics we have, as modern surgical methods are proving.

The next order of business was a paper by Dr. E. L. Kanaga, entitled "Some Points in Soldering."

[This paper is printed in full at page 878 of the present issue of the Cosmos.]

Discussion.

Dr. Gaskill. From my experience in handling metals, it seems to me that the sweating process is rather dangerous, because there is always the possibility of burning the metal and making it brittle. Therefore I cannot see that the advantage gained by the sweating process is sufficient to warrant one in taking such a risk. A metal heated beyond a certain point is bound to become more or less brittle, and to lose strength in that way. The soldering process, in my opinion, is preferable to any sweating process that may be used.

Dr. Inglis. I would like to ask Dr. Kanaga whether he paints the parts with borax solution, and I would like to have him explain a little more fully just how he prevents that pitting which we find, particularly in the use of some of the 18-karat solders.

Dr. W. J. Robinson. It is rather difficult for me to discuss this paper, as I utilize the casting process and detachable teeth in all my work, and the paper deals with the use of soldered teeth in bridge work.

In making crowns I use the sweating method, and agree with Dr. Kanaga that it secures the best joint and prevents the reopening of the joint, which may occur when solder is used. Dr. Kanaga has said that only a minimum quantity of solder should be used, as a large body of solder weakens the piece, yet he constructs the body of the bridge with solder, which he has said is a more brittle metal than gold plate. Of course the 22-karat solder which we buy from the dental depots assays at about 19 karats, and the 18-karat at about 15 karats. Why not make the body of the bridge by the casting process, and use a high-grade gold or one of the gold alloys now manufactured for this purpose, using solder only to unite the several pieces?

In constructing a bridge, I make and

finish the abutment pieces by the casting process. The body of the bridge is made in one casting and united to the abutment pieces by using a minimum quantity of high-grade solder. For casting I use the Tenax investment compound, as it does not warp or crack under intense heat, nor does it expand. It is easily handled and seems an ideal investment material. Red birdsand when used for investing may cause discoloration of the teeth embedded in it. This discoloration is caused by a chemical change which takes place upon heating the investment. I have often been asked what causes the discoloration of teeth during the process of soldering, and upon investigation found that red birdsand had been used in the investment. I took this up with a manufacturer of teeth, and he traced it to red birdsand.

With regard to drying the investment, I cannot see any reason for allowing an investment to dry out over night. As soon as the investment has set sufficiently to hold together, it is placed upon the fire, and heated slowly for a few minutes until it is thoroughly dried. Then the flame is turned on full, and in a short time the investment is thoroughly heated. It is very important to have the piece heated to the proper temperature before attempting to solder, most checked teeth being the result of attempting to solder a piece before it is properly heated. I use solder and borax in the manner described by Dr. Kanaga, but, as I said before, I use only replaceable teeth, and cannot see why soldered teeth should be used, for the reason that they have so many disadvantages, and also because bridges constructed with them are unhygienic.

Dr. A. P. Lee. I believe I am fairly familiar with Dr. Kanaga's technique, but one never listens to a paper without getting one or two valuable points. I want to thank him for the suggestion that in cases where we wish the teeth practically to approximate, and yet desire a minute space on the approximal surfaces, to prevent checking, the piece should be invested so that the wall of plaster will retain the positions of the teeth in the investment, and then the approximal surfaces be touched with a small stone to obtain the space required.

Dr. Kanaga (closing the discussion). Dr. Gaskill mentions the fact that by heating to a certain temperature gold is rendered brittle. I cannot explain that, but I have noticed that gold after having been brought almost to melting temperature is brittle and breaks into many pieces.

Dr. Inglis asks for some suggestions as to the use of borax. I do not paint the parts with borax paste; in fact, I do not use it at all. In dealing with facings I think we should keep away from borax paste as much as possible. When soldering a bridge, only a very minute quantity of powdered borax should be used, and very often it is not necessary to use any, because, as I said, the parts in the investment do not oxidize readily. It is the zinc in solder that oxidizes and causes that crust which gives us so much trouble. If the solder itself is kept clean, there is no need for any borax. The solution that I speak of is borax and boracic acid powder equal parts, to make a saturated solution. I also keep a box of powdered borax handy when using 18-karat solder. In coin solder the oxidation does not take place so readily, and liquid flux is sufficient, but at times I find it necessary to use powdered borax with 18-karat solder.

Dr. Inglis. Will the solder flow down into those fine points where you wish it to go without using liquid borax?

Dr. Kanaga. That is a question of heat, I think—a question of heating the entire piece to the proper temperature. Dr. Robinson states that he does not use solder; as a matter of fact, I do not use solder myself to any great extent for entire bridges. I find it necessary for some reasons, at times, to resolder bridges, and in such cases when the bridge has to be reheated, the cemented teeth are a great objection. The zinc in the cement I suppose burns into the platinum pins, which become brittle, and the facings, either at that time or sometime later, will break off very easily.

Dr. Robinson. I never resolder a bridge that has cemented teeth on it without first removing the facings.

Dr. Kanaga. How do you get them off?

Dr. Robinson. Simply by investing, heating up, and allowing the piece to cool, then removing and placing it in a solution of twenty per cent. nitric acid. This will readily dissolve the cement, and the facings can then be easily removed.

Dr. Kanaga. I have never taken facings off that way, although I have had occasion to resolder bridges with cemented facings. I wish to thank Dr. Robinson very much for his suggestion.

Dr. A. F. Jackson gave an illustrated talk on "The Construction of a Porcelain Corner."

Dr. George C. Küsel recited an interesting case from practice of seborrheic eczema which was mistaken for arsenical necrosis, following the devitalization of a tooth pulp by arsenic.

The society then adjourned.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

Forty-seventh Annual Meeting.

First Day—*Afternoon Session.*

The forty-seventh annual meeting of the Dental Society of the State of New York was opened on Thursday afternoon, May 13, 1915, in the assembly room of the Educational Building, Albany, N. Y.

The president, Dr. A. M. Wright, Troy, called the meeting to order at 2 P. M.

The Rev. Dr. Frank M. Blessing, Albany, invoked divine blessings on the deliberations of the society.

Address of Welcome.

By the Commissioner of Education.

Dr. Wright then introduced to the society John H. Finley, A.B., A.M., LL.D., commissioner of education of the State of New York, who delivered the welcoming address to the society, as follows:

Mr. President and gentlemen of the State Dental Society,—I have been asked to say a welcoming word, and I have accepted not only because we of this university have a concern for the standards and service of this profession, but also because we are beginning to appreciate your part in contributing to the effectiveness of the school.

IMPORTANCE OF DENTISTRY IN THE PRESERVATION OF HEALTH.

I have asked our newly appointed state medical inspector, Dr. William A. Howe, under whom the medical inspection of all the children in the schools of the state is carried on, to aid me in expression of this appreciation. These are some specific facts which he has furnished in response:

There are 4632 dentists in New York State. Next to the physicians, the dentists form the largest and most influential organization of conservators of the health of the public in the state. Like the physicians, the dentists are doing an enormous amount of gratuitous work, and are always found willing to do still more. Only during the past few years has the real value of a good dental equipment and a clean mouth been fully appreciated.

In our leading hospitals it is becoming

more and more mandatory that every patient, before undergoing a serious surgical operation, shall first be subjected to a careful cleaning of the mouth and repair of defective teeth.

In our great institutions where tuberculosis is being so successfully treated, the dental dispensary is today recognized as an indispensable factor in the care of the tuberculous patient.

In several cities of the state, the number of which is steadily increasing, dental dispensaries are being operated, either associated with or independent of our union school system.

The medical inspection law administered under the direction of the Education department hopes and expects to do much both in preventive and corrective educational work in the care of the teeth. For a time it is to be expected that much volunteer work will necessarily have to be done by local dentists, until the various municipalities can be brought to realize the importance of this feature of educational work. It will be the aim of the department to enlist the co-operation of the dental profession of the state in this campaign for cleaner mouths, better teeth, and better health for the school child.

It would seem as if, through the dental profession, a most successful system of education of parent, teacher, and child could and should be conducted.

To insure good health it is highly essential that we begin at the gateway of the body, making certain that this avenue is clean and properly equipped for its important functions. Our educational institutions should be more extensively utilized in extending the propaganda of clean mouths and good teeth.

What Dr. Howe has said I would repeat without quotation marks as expressing the basis for my welcome to you who represent that profession.

But I wish to welcome you as those who work with the Creator to make some of his laws operate to counteract others.

I think of this university as a physical and spiritual agency for helping the Almighty to conserve what he has created. And I wish to think of you not as men engaged in commercial, gainful enterprise, but as an association, a brotherhood, as Professor Palmer put it not long ago in this very room, to make a more comfortable and more beautiful human world. For I think of your mission as not merely that of relieving pain and improving machinery, but of making faces more beautiful.

I have been reading recently a satire on our English civilization—a description of a land where, in the desire to develop a sound and beautiful race, individuals who are physically ill are treated as we treat the criminal. One chapter describes the trial of a person for pulmonary consumption. Toothache would undoubtedly there be considered as a misdemeanor, punishable by fine or imprisonment unless the individual could correct his offense. This seems all very absurd, but think of how the pain and ugliness and inefficiency could be reduced, if only we could be as insistent upon as high a degree of physical as of moral hygiene.

Again I give you most cordial welcome, and I hope that our hospitality may act as an anesthetic that will make you insensible of any pain or discomfort while under our roof.

The next order of business was the reading of the annual address by the president, Dr. A. M. Wright, Troy, as follows:

President's Address.

By Dr. Albert M. Wright, Troy.

In the exercise of your rights of self-government, one year ago you committed to my care the honor of being your presiding officer for the ensuing year. In the discharge of my duties I have used all caution not to strain the constitution or by-laws to a breaking-point.

My duties have been many, but I have found in them great pleasure, the greatest of which has been the meeting of so many big-hearted, clear-headed, broad-minded men from all parts of the state, and all of them dentists—dentists whose greatest aim in life is the greatest good to the greatest number of their fellow men.

DUTIES OF THE PRESIDENT, AND THEIR DISCHARGE.

Section 8 of our by-laws provides that the president shall "render a concise statement of the condition of the district and state societies at our annual meeting," and in order to do so I have tried to place myself in close touch with every district society within the state, as well as the Jefferson County Dental Society.

On November 19th, 20th, and 21st I visited the union meeting of the Fifth, Sixth, Seventh, and Eighth districts convened at Buffalo. It was a largely attended meeting, with a membership of 453 in the four districts. There were registered on the second day over three hundred members. Dr. Roberts, president of the Eighth district, told me that in his district alone there would be an addition of nearly fifty to the membership by May 1st.

On December 11th I visited the baby of our family—the Ninth district—and I assure you the baby has outgrown its swaddling-clothes. It is one of the most wideawake district societies in the state, and developing very fast. The attendance was good, comprising forty-two out of a membership of fifty-five. The enthusiasm displayed more than made up for the small membership. The program was good, the essays above the average.

On December 12th, following a night's ride on the train from the Ninth district at Yonkers, I visited the Jefferson County Dental Society at Watertown. This society is within the jurisdiction of the Fifth district, and I believe all are members of that society. Greatly to my surprise, I found a large, flourishing society, with an attendance much larger than many of our district societies, and all seemed intensely interested in their work. The speaker of the day is well known to you all, Dr. Weston A. Price of Cleveland.

On January 19th I visited the Fourth district and had the pleasure of hearing the secretary read the names of twenty applicants for membership. The Fourth District Society always furnishes a fine program, and is well noted throughout the state as having the finest lot of men found in any district. Expense in having a first-class meeting is never taken into consideration, as the "boys" in that district are all rich—or at least rich in hospitality. Of a membership of seventy-one, fifty were in attendance.

On January 23d I had the pleasure of being a guest at a banquet given by the Buffalo Dental Association. This is one of the oldest dental associations in the state, being much older than the district or state societies. As a matter of fact in 1867 this society appointed Drs. Whitney, Snow, and Southwick a committee to confer with the dentists throughout the state, with a view of introducing into the legislature a measure to legalize the practice of dentistry, and obtain a charter for the district and state societies.

On January 30th I met with the Executive Council and Special Law Committee, at Syracuse.

On February 11th I had the pleasure of visiting the Second district in Brooklyn, accompanied by about fifteen members of the Third and Fourth districts. This was, in fact, a return call, the Third and Fourth having had the pleasure of receiving a large delegation from the Second a short time previously at Troy. I assure you, this visit was a red-letter night for all who made the trip. Of a membership of 225, about 180 were in attendance.

On March 1st I attended a meeting of the First District Society at the Academy of Medicine. Of a membership of about 400, nearly 250 were present. There is little need for my saying anything of the First or Second District Dental Societies. We all know that from those two societies emanates the best, the brightest, and the cleanest and most up-to-date thought that is given to the dental world. From here the most modernized methods of any specialized line of dental practice are spread broadcast. The only criticism I would

offer is that the membership of both societies should be doubled each year for some time to come. You have the material, the timber, for the largest and best dental societies in the world. All that is needed is a little concerted action by the older members, a little give-and-take by all, and a little more "wearing of the harness" by the young men.

On March 26th I visited the Sixth District Society at Binghamton. Although I had visited the Sixth in conjunction with the Fifth, Seventh, and Eighth at Buffalo, I thought it advisable to do so again. The Sixth District Society has a membership of about eighty, forty-six of whom were in attendance. Five new names were presented for membership. Although the attendance was but a little over one-half of the membership, the proceedings were of great interest, and a majority of those present took part in the discussion of the papers read.

On April 17th I attended the Third district, making good my forty-fifth consecutive annual meeting—a lifetime without a miss of annual or semi-annual gatherings. I listened with great pleasure to the reading of twenty-five applications for membership, the greatest number ever known at any one meeting in the Third district. While our membership was sixty-two one year ago, we now have eighty-seven. Sixty-five members were in attendance. It is best that I say nothing more of the Third district, because you might accuse me of being prejudiced in its favor. Suffice to say, it is my first love.

The Seventh district invited me to attend their meeting on April 9th and 10th, but I was obliged to decline. I am thoroughly convinced after visiting the various districts that most of us are depending too much upon outside talent for essays, to the detriment of home talent, which is allowed to lie dormant year after year.

It is certainly up to every district to strengthen and build up the efficiency of its individual members to take their proper station in their own district work, as well as in the State and National societies. All essays that I heard from home talent were well-written and would reflect credit upon the home district if read before any dental society.

CONDITIONS REVIEWED.

I feel assured that the component parts of our State Society were never supported more loyally, and were never more prosperous and harmonious than at present. Much greater efforts are being made in the country districts for an increase in membership than in the large cities. We must ever bear in mind that "As the twig is bent, the tree is inclined," and do all in our power to induce the young man to join his district society and get into the working harness. Last year the First district reported 427 active members; at present they have 432, a gain of five. We must not forget that some were dropped for non-payment of dues—so five does not represent the total of new members.

The Second district reports thirty-two new members during the year; the Third district twenty-four; the Fourth district twenty; the Fifth a loss of four; the Sixth district a gain of eight; the Seventh district fourteen new men; the Eighth thirty-four new members, and the Ninth district thirteen new men—our total gain will be about one hundred and fifty.

Last year there were registered at our May meeting 373, or 276 members and 97 visitors. Divided among the districts, there were present, from the First, a little over one-eighth of their membership, or 51; from the Second, a little over one-ninth, or 26; from the Third, about three-fifths, or 39; from the Fourth, a little over two-thirds, or 52; from the Fifth, a little less than one-third, or 29; from the Sixth, a little less than one-seventh, or 11; from the Seventh, a little less than one-eighth, or 15; from the Eighth, a little less than one-ninth, or 18; from the Ninth, a little over one-third, or 35.

Of the 97 visitors, 48 were from this state: From the First district, 11; from the Second, 2; from the Third, 9; from

the Fourth, 14; from the Fifth, 7; from the Sixth, 1; from the Seventh, 2; from the Eighth, 0; from the Ninth, 3.

OUR STATE SOCIETY.

I have been expecting a good healthy increase in attendance this year. We have a membership at present of about fourteen hundred, and certainly it is not too much to expect fifty per cent., or seven hundred, present, all knowing that we meet but once a year. It would almost seem, at times, that we have members who spend the entire year trying to devise some honest means of proving an alibi for staying away from our sessions. If they were more conversant with the big Book, they might try the old excuse for not doing their duty, "I had to go bury my father."

Our state contains over five thousand registered dentists, and we should have at the very least three thousand members in good standing. This can be easily accomplished within one year by the concerted action of our individual members.

ESSAYS.

At this meeting you cannot afford to miss any part of any paper. The writers are among the most prominenf in their special fields. The speakers who have promised to open the discussions are the best we have in this state, and their subjects are well in hand.

SCIENTIFIC RESEARCH WORK.

I expect every member to be present at the presentation of the report of the Scientific Research Committee by Drs. Dunning and Gies. Each year the report is getting closer into our working life, our pleasures and trials.

You cannot afford to miss any reports, because you know it is customary for this society to bury all its essays and reports until all semblance of freshness is removed, or perhaps it is for the purpose of giving any new theories a chance to explode before they are put into print.

CLINICS.

Our clinics, which will be held on Friday morning from 9.30 to 12.30, are in the hands of Dr. Warrington G. Lewis, as chairman, assisted by one good man from each district. When Dr. Lewis puts his hands to the plow, he never looks backward, and this fact insures his best work and a good clinic.

GOLDEN ANNIVERSARY.

As our State Society was organized on the first Tuesday in June 1868, our fiftieth anniversary—our golden jubilee—will occur in the spring of 1918, three years from now. We have no time to waste if we wish to celebrate that event in a suitable manner for the Empire State. And if we do celebrate at all, it must be in royal form. First, we must raise a goodly sum of money, because the expenses will be heavy. We ought to have at least four thousand dollars to spend, and we have only the three years to raise it in. Just think what this celebration would stand for!—the golden anniversary of the society which has given more to the dental world than all other societies combined. We must be prepared to entertain many celebrated men from abroad as well as from distant parts of our own country.

We must be prepared to devote nearly a week to this celebration. There is one unpleasant feature: Albany cannot furnish accommodations for those who would attend. It must occur in some city where space and hotel accommodations are unlimited. And one important feature of the celebration is, we must have occupying the presidential chair in 1918 a big man, a brainy man, a broad man—one who is a leader among men. We have just such men in our society, and one should be elected vice-president in 1916, one year from now, in order to be in line in 1917. My great object in bringing this before you is that we have no time to lose if we celebrate in style suitable to the reputation of this society throughout the world.

To bring this subject into some form

for consideration, I would recommend that a committee of three be appointed to confer with the Executive Council as to the advisability of such a celebration, and if thought advisable, to devise some method for raising the required funds, a report from said committee to be made some time during one of our sessions on Friday.

PRINTING PROCEEDINGS.

I wish to call your attention to a subject of vital importance to our society, the publication of our proceedings. We are in the unfortunate position of having no journal of our own, or one in which we have the slightest financial interest. All proceedings are placed in the hands of a journal published outside of this state, and the proceedings are published whenever there is room, and we receive the full report eleven months after the meeting.

Think for one moment of a scientist laboring over one line of thought for months or years in investigations, and gathering data to be presented to the dental world through the Dental Society of the State of New York, where it is read—if the essayist be fortunate—to an audience of two hundred, and then buried. A labor of love extending over years of time buried beyond resurrection, or until the whim of a publishing house blows its trumpet some fine morning, and lo! it goes to print! Every essay and committee report read before this society represents work, and should have an audience of forty thousand dentists within six weeks after reading—but it is buried. Someone working along similar scientific lines takes the result of his research work directly to the publisher, and forty thousand dentists read it, while ours lies buried to be resurrected eleven months later.

We as a society should give the writer who presents a paper or a report before us all honors possible, and that would include giving his work to the world at the earliest possible moment, and in its best possible condition.

I would most earnestly recommend that the Committee on President's Address present this subject to the Executive Council, with an urgent request that they devise some means of having the proceedings of this society published within a reasonable length of time.

HARRISON ANTI-NARCOTIC LAW.

The dental profession is in a very fortunate position under the Harrison Anti-Narcotic Law. I do not object to the license fee of one dollar per year, even if it does cost one dollar and thirty-two cents to collect it. It is the half-dozen other little penny-ante conditions and records to comply with. It would seem a good time for fifty thousand dentists to get in close touch with their representative in the National Government for relief of some nature.

LEGISLATION.

I regret exceedingly that we failed during the past session of the legislature in passing the dental measure proposed by our Special Law Committee, and agreed to fully by the Executive Council.

I am not a politician, nor do I know much of lobby work, but if this society wishes to get any measure through the legislature, we must have a man on the ground who can stick to the bill day and night, and who understands all the "tricks of the trade" of putting bills through. This would cost money, but the bill would get to the governor for signature or veto. I am decidedly in favor of, and would so recommend, that in the future, if a bill is introduced into the legislature by this society, as soon as it is printed, a copy be mailed to every member. I feel safe in saying that not two per cent. of our members knew the text of any one of the six dental bills introduced into the last legislature. These bills as printed can be obtained at very small cost and distributed by our secretary. I assure you that the secretary should in some manner earn his large salary! Each member having a copy of the dental measure would be in much better condition to approach his

assemblyman in favor of its passage or defeat.

As our present law stands, it seems foolish for our society to expend money in trying to enforce it. New York City is the only place in the state where convictions can at all be assured, and if the offender is convicted the fine is paid—and the culprit moves up-state, where practicing is absolutely safe. I shall make no recommendations on this subject, but simply bring it to your notice as a body. Will it be best for us to increase our indebtedness any more until we have passed and signed a suitable measure, placing the prosecution in the hands of the Attorney-general?

INVESTIGATION OF THE STATE SOCIETY.

A resolution was introduced in the assembly to investigate the New York State Dental Society, which was charged with graft by the introducer of the measure. I immediately wrote Speaker Sweet, saying we would be "de—ee—lighted," and courted the closest investigation of all of our acts—I would order all records of our society placed at their disposal at any time or place, and also stated that all records of the board of examiners during the past twenty years were in the hands of the Regents, and of course at their disposal. In reply, Speaker Sweet wrote, "Nothing doing."

DEMISE OF DR. A. M. HOLMES.

I do not feel that I can close my address without referring to our charter member, Dr. A. M. Holmes, who since our last gathering passed the great divide. His was a life rich beyond comparison with a love of nature; his greatest aim was that all might share his heritage. Sturdy as the oak and rock in every storm of life, he was as tender in love, in sorrow, and in home life as the clinging vine whose tendrils are constantly seeking support and nourishment from a stronger source. As a botanist, his rank was of no mean order, very few knowing all wild flowers as intimately as did Dr. Holmes. During his active life he owned and cared for personally a large greenhouse just to supply flowers to the sick and poor without expense. A beautiful rose was never quite as beautiful to him as when being admired by those whose sickness or age prevented an active life. Dr. Holmes, as the most of you remember, was a quiet, reserved, self-contained man, but at home he was a child with children, and having none himself, his home was a playground for all who cared to come. He entered into their life and sports as few others could; among his happiest hours were those with little children, wandering through the woods and fields gathering wild flowers, and giving them their first lessons in love of nature.

There is such a thing as living too long; I never realized it until I attended Dr. Holmes' funeral, at Morrisville. All friends of his own age were gone except one man, but his house was filled, and his last resting-place covered with wild flowers gathered by those whom he had taught, as little children, to love everything that was beautiful; gathered by those whose full life will be better, sweeter, and purer for having been led by the hand of Dr. Holmes through the fields of nature.

Dr. Holmes loved all that was beautiful. He was a friend of all in distress. Music and flowers caused his eyes to dim with tears, but those tears did not prevent him seeking with the purest heart and loyal hand those in need of sympathy and love. I would simply bow my head and pay tribute to a man I had learned to honor, respect, and love, from a close association covering twenty years on the Examining Board. Our Committee on Necrology will inform you fully of his active professional, as well as civil life.

DISCUSSIONS OF ESSAYS.

I wish to bring to your attention the fact that in selecting men to open the discussions on the various papers and reports only three have refused, and two of them wrote me that, when the papers were open for general discussion, they

would be very glad to participate. In my opinion that is a wonderful record for any society; every man with his shoulder to the wheel ready to push our forty-seventh annual meeting to a success.

In conclusion, I wish to thank Dr. H. J. Burkhart for invaluable advice which he has so freely given. I fully appreciate his ever kind and courteous replies to my many demands on his time.

To all committees, elective or appointive, I would give credit for the greater share of any success achieved during my administration.

The Chairman appointed the following as the Committee on the Address of the President: Drs. L. Meisburger; A. W. Twiggar; F. F. Hawkins;—who returned the following report:

Report of Committee on President's Address.

ALBANY, N. Y., May 14, 1915.

TO THE COUNCIL:

Gentlemen,—The Committee on President's Address respectfully presents for your consideration the attached report:

Your committee desires to congratulate the association upon the able character of the President's address. It exhibits a watchful interest in the welfare of this society and the profession generally.

We respectfully report the following recommendations:

(1) We recommend that the suggestion of the president for the celebration of the golden anniversary be approved and that the Executive Council be requested to appoint a committee to carry out the recommendation.

(2) The committee have complied with the president's recommendation for the early publication of the State Society proceedings in the dental journals, and have conferred with the Executive Council.

(3) Your committee recommend that in the future, if a bill is introduced into the legislature by this society, as soon as it is printed a copy be mailed to the president and each member of the executive committees of the district societies.

(4) We suggest that in the future, as a means of efficiency, the president forward to the Committee on President's Address a copy of the recommendation he contemplates presenting. This would enable such committee to give this matter more mature and deliberate thought.

LOUIS MEISBURGER, *Chairman,*
F. F. HAWKINS,
ALBERT W. TWIGGAR,
Committee.

The next order of business was the reading of the Report of the Correspondent, by Dr. L. M. WAUGH.

[This report is printed in full at page 862 of the present issue of the COSMOS.]

Discussion.

Dr. E. A. SMITH, Rome. I feel that the Correspondent is to be especially congratulated on his selection of questions for his report. The answers which have been brought out have been so thorough and cover the ground so well that there is but little to discuss. I believe the Correspondent is warranted in all of his conclusions with the exception of one or two, and of these I will speak.

With regard to question 1—"Do you recognize normal occlusion as the basis for all branches of dental practice?"—I like the answer given by Dr. Dunning, "As an ideal basis, not always attainable." As to question 4—"What percentage of so-called pyorrhea do you consider to have had its inception in malocclusion?"—it is undoubtedly true that a large majority of cases of pyorrhea are due to malocclusion, but this is not always the case. The question as to a full complement of teeth being essential to normal occlusion, I think, is very difficult to answer, for the reason that we see so few cases of normal occlusion, and I doubt if I have seen in practice fifty cases of absolutely normal occlusion. With regard to question 7—"Do you believe it best to conserve the third molars which have erupted and taken practically normal positions?"—I can see but one answer, considering the way that question is asked. We must, of course, conserve them if they have erupted and taken their normal positions. If, however, the question were, "Would you always conserve the third

molar?" I would say, "No," for the following reason: Recently a young lady who has been under my care since childhood, and who is now attending Wellesley College, came to my office for dental work. Up to the time of eruption of the third molars she had a most perfect occlusion, but when the lower third molars began to erupt I noticed a very much changed condition. There was a large amount of inflamed tissue and much pain, which I attempted to alleviate. But in my effort to preserve the third molars I found that the occlusion was becoming distorted. I removed these molars, and it is difficult for me to imagine that in her later years these molars will be necessary to retain the approximal spaces.

With the balance of the questions I fairly agree. I imagine that two-thirds of those present will agree with most of the reporter's conclusions, but the question which later came to my mind is, How can we obtain perfect occlusion? The restoration of the occlusal surfaces is not so difficult in these days of casting, but in cases of orthodontia I believe it to be a more serious matter. What is the man to do who is practicing in a smaller town, perhaps fifty miles from an orthodontist, and who has not the ability to do orthodontia, and most of whose patients are not able to go to the orthodontist in the city or to pay his fees. Imagine such a case: A patient presents at his office with one of the most common irregularities, viz, the canines outside the arch, and perhaps the laterals and bicuspids are touching. This operator may know the classification according to Angle, and perhaps know how it should be regulated, but he also knows that the patient is the child of a man who is earning twelve or fifteen dollars a week, and who cannot send the patient to the city to an orthodontist. He has only two alternatives. He may send the girl to the orthodontia specialist fifty miles away, at a cost of five or six hundred dollars to the patient, or he may treat the case himself. If he is a philanthropist, or expects to inherit money, he will probably treat the case for two hundred dollars. What is the result? Because of the expense necessary, the girl will for the rest of her life retain this condition, which will not only be unsightly but will eventually grow worse. Or he may extract the first bicuspids—I am not advocating this procedure, but, if so, has he not done the best for the patient under the circumstances? In later years the boy or girl may be in different circumstances, and go to another dentist, who immediately asks who extracted these teeth, and when he is told, condemns the first dentist without taking into consideration the circumstances. I am dilating upon this feature for one reason: When cases come into our hands, we should consider the situation, realizing that the man who is doing the best dentistry is the one who is doing the greatest good for the greatest number of people. This is not any reflection on Dr. Waugh's statement that we should strive for the ideal, but it is not always possible to attain it.

Dr. Morton Van Loan, Albany. It is very difficult for me to discuss this report critically, because I am in full sympathy with the ideas and ideals of the Correspondent. While I feel that many of the conclusions of this report, especially if carried to the extreme, are too idealistic to be practicable for the majority of dentists, still everyone, no matter what his position in dentistry, should have these ideals before him, in order that he may progress. He should feel that progress is the best condition under which anyone can labor, both from a financial standpoint and for the building of character.

As to the first question asked by the Correspondent, I should suggest that it read, "Do you recognize normal occlusion as a basis of all branches of dentistry, looking to the preservation and restoration of health, from a dental standpoint?" for I feel that the dentist should look after the preservation of the teeth as a means for the preservation and restoration of health.

To question 2 I should answer, Yes. To question 3 I should answer, Yes.

To question 4 I would like to say that the Correspondent's conclusions seem to be rather exaggerated. Taking the percentages he received and averaging them, the result would make a little over fifty per cent. who believe that pyorrhea has its inception in malocclusion. Personally I do not like the wording of question 4, because from my conception of pyorrhea I feel that the question should be worded, "What percentage of so-called pyorrhea do you consider to have had malocclusion as a contributory factor in its inception?"

I do not mean to attempt to go into the causes of pyorrhea, but it seems to me that malocclusion can only have a contributory effect upon this disease, but is not the direct cause, because we find very few mouths with perfect occlusion, and yet hundreds of these mouths exhibit no pyorrhea.

While we feel that in many cases of pyorrhea the disease would not have been caused had it not been for the malocclusion, still other systemic conditions must have brought about a predisposition, so that malocclusion, or filth, or traumatism can make their influence appear to be the real cause of the pyorrhea. We find a very wide difference of opinion as to the cause of pyorrhea, and I feel that we must determine first the one or several conditions which bring about pyorrhea, before we can obtain a consistent result in its cure.

In regard to percentage, H. M.. Semans says, "Very high; can't conceive of so-called pyorrhea in normal mouths, if proper chewing is done." This statement contains a little joker. Teeth must be in normal occlusion, and patients must use them properly and thoroughly, else a favorable systemic condition for the inception of pyorrhea will be provided. Therefore we must not only obtain normal occlusion, but we must instruct the patient how to use normal occlusion properly.

In his conclusions, the Correspondent says that malocclusion is the most important causative factor in so-called pyorrhea, and conversely, pyorrhea is seldom to be found when the teeth are in normal occlusion. I would also like to emphasize the importance of proper mastication and proper diet, which is being more and more generally recognized.

By way of illustration, I would cite the case of a little patient who, though not a delicate child, suffered from coughs and cold continuously; finally her kidneys were suspected, and she was put on a diet, without meat and potatoes and with little sugar. As a consequence, her condition is much improved and the cough has entirely disappeared.

To question 5 I would answer, Yes. To question 6, Yes. To question 7, Yes. To question 8, I would say that a dentist's first duty is to preserve normality. To question 9, If possible, yes. This also covers question 10. To question 11, Oscillating bite. To question 12, Yes. To question 13, Yes. To question 14, Yes. To question 15, Yes.

Dr. Abram Hoffman, Buffalo. First of all I want to compliment the Correspondent upon his work, and to express my appreciation of his having brought the subject of normal occlusion once more to our attention, as this is a subject which is perhaps not as fully appreciated by all of us as it should be. The conclusions presented should be looked upon with much favor, as they voice the opinions of some of the best practitioners of dentistry.

It is somewhat difficult to discuss a report with which one is in entire accord, and in which the replies to the questions are practically all of the same thought. Of the 260 letters sent out, 138 answers were received; that is, slightly more than one-half of the men to whom the letters were addressed answered them. Of the 138 there were 120 who sent in what might be termed favorable or affirmative answers, which is a large enough percentage to warrant our accepting the conclusions as they have been given by the Correspondent.

I was very much interested in the report on questions 3 and 4, and hope that the next speaker will tell us why he does not approve of study models, when their use is almost universally advised. It

seems to me that any practitioner can benefit and improve upon his restorations, appliances, etc., if he has study models at hand, and that in the treatment of pyorrhea their use would be of very great value in studying the different points of contact, forces, etc. In this connection I might mention that models may be mounted upon the new Snow articulator with the face-bow in such a manner that the antagonizing surfaces of the teeth, the alveolar surfaces, etc., will bear identically the same relation to the hinge of the articulator that they bore to the temporo-mandibular articulation—hinge—in the living subject. This is a very great advantage and of much importance; the technique for accomplishing these results is very simple.

I was pleased to read Dr. Bogue's answer to question 10 as to the advisability of moving teeth that have drifted as a result of extraction, and I think he has made a strong point in advising that in moving such teeth it is well to be careful, or we may elongate the tooth and open the bite, causing much annoyance and the probable ultimate loss of the tooth.

With reference to questions 12 and 13, I feel that the face-bow is one of the most important aids that we have in prosthesis. Its importance and advantage is apparent not only in full cases, but in partial cases as well. It is interesting to note Dr. Wilson's emphatic answer to this question.

With reference to the restoration of marginal ridges, I feel that the strong point is the fact that these ridges, sulci, etc., must be developed or worked out so that they are in absolute harmony with the other teeth remaining in the mouth. There is no question as to the advisability of reproducing these ridges and sulci. It is only a question as to the extent to which they should be developed.

Dr. R. G. Hutchinson, Jr., New York. I want to repeat what I said to Dr. Waugh in my reply to his letter, and what he was too modest to mention, namely, that I wished to congratulate him on the selection of the subject for his report: "To my mind, if it receives the attention it deserves, it will mark a new era in the practice of dentistry." I have been of this opinion for a long time, and it gives me peculiar pleasure to have this subject brought to the attention of the profession at this time. During the past five years of routine practice I have been more and more deeply impressed with the imperative necessity of taking into consideration malocclusion in the treatment of oral pathological conditions. Malocclusion may not be responsible for the inception of pyorrhea in all cases, but when the pathological conditions have reached an advanced stage, malocclusion is a most important factor. Of course, other mechanical injuries to the soft tissues will bring about a pathological condition, if neglected, and if such injuries have occurred, the resultant conditions are not necessarily attributable to malocclusion.

With regard to question 1, I would like to enlarge a little upon the reason why I believe occlusion to be the basis of all dental practice. I would prefer, however, to state it this way—that malocclusion may be, and in the majority of cases is, the basis of all pathological conditions, the cause, direct or indirect, of all lesions of the oral cavity involving the teeth and their environment. Malocclusion may be general or individualized. In the first place, general malocclusion is conducive to the establishment of unsanitary conditions. It is most difficult for children to keep their mouths clean or in a relatively sanitary condition at best, but when the teeth are in malocclusion or malposition, lodging-places are offered for vast quantities of food débris, which furnish breeding-places for bacteria. This is the first factor conducive to the establishment of disease. The next factor in malocclusion is that it is impossible for the organs to perform their normal function; the children do not acquire the habit of masticating food properly, in fact it is impossible for them to do so. In order to have a perfectly normal and healthy

organ, that organ must perform its function. When function is not properly performed there is capillary stasis, and an accumulation of toxins results. If the toxic matter is not carried away, and the tissues do not receive proper nourishment for the upbuilding of the cells, the result will be degeneration of the tissues, with consequent low resistance. The third factor in malocclusion is that in the performance of the act of mastication there is greater pressure at certain points than at others, and the effect is like having two cogwheels with the cogs of unequal length and width, or like having a building placed upon piers of unequal height; the stress will be brought to bear on the high points. There is not, necessarily, a breaking-down at once; the pressure may be mild and the tissues very resistant, but everything has its breaking-point, and ultimately there will be a breaking-down of resistance, and the establishment of a pathological condition through the presence of bacteria which under normal conditions are relatively harmless. When the mouth is normal the resistance is sufficient to withstand infection, but when the resistance is overcome, infection will occur, and in the great majority of cases it is through trauma that infection becomes established in the tissues, causing a progressive degeneration. Thus at points under excessive stress, trauma occurs, which is the starting-point of infection.

Another factor in malocclusion is the crowding of the teeth, contraction of the interproximal alveolar plates, reducing the circulation and nutrition, and making them more vulnerable to attack. All of these are reasons why I believe malocclusion to be the most important factor in the establishment of pathological conditions affecting the mouth.

I believe the majority of the men who have answered the questions have had particular reference to orthodontia operations. I said in my reply that I wished to be excused from answering questions except those which had to do with the specialty that particularly concerns me, and my answers were therefore made with that reservation in mind.

With regard to the second question, "Do you consider the full complement of teeth or their anatomic duplicates as essential to normal occlusion?"—generally speaking, I certainly do. In my answer to the report I said, "A full complement, with the exception of the third molars."

In regard to the matter of making study models, I believe the majority of those who answered the question have had in mind orthodontia operations, and I certainly do believe that in orthodontia procedures study models are absolutely imperative, but in the study of pathologic conditions I do not believe them to be imperative for the experienced man. The beginner can get a better idea of the contact points, the occlusal surfaces, etc., by making study models, but the operator who has had considerable experience can get a better idea of these points by studying the cusps and facets of the teeth. I am not referring to the mouths of children, because children rarely come to us for treatment of infections, but of more advanced cases, from thirty years upward. When the teeth are in malocclusion, there will be facets on them indicating where there is malposition, and in opening the mouth and studying these it is quite easy for the experienced operator to study each surface of each tooth, and find where there is need of correction by grinding. We cannot hope, except in rare instances, to correct the malocclusion in adults by moving the teeth into normal positions, but we must treat these cases in another way. One of the reporters expressed the belief that a large percentage of these cases can be treated by the use of the grindstone, and I agree with him fully. We must correct malocclusion, we must establish as nearly as possible the normal line of occlusion, first by grinding down the high points, using articulating paper to indicate the high points, and one can do this better in the mouth than with the aid of study models. One cannot,

with study models, tell which tooth is loose, or in which direction the tooth will move, so well as one can by studying the mouth itself. When the teeth are brought into contact, we can watch and see where the teeth move in their sockets, and we can readily relieve these points, and then, by going through the movements which Dr. Waugh described in the construction of bridge work, again grind the high points so that in every position the stress is equally distributed. Another consideration is the restoration of convex contact points, instead of planes which have been worn down, and which bring about a lateral stress of the teeth such as Nature never intended. This can be done by grinding and observing the conditions directly in the mouth. What is the use of study models for such treatment as this? I do not believe they are necessary, except, as I stated in my answer, in teaching the inexperienced.

In regard to the preservation of the third molar, this tooth may have a function when in normal occlusion, when the mandible is large enough to accommodate it properly, but when the third molar lies alongside the ramus, with the soft tissues overlapping, usually, I think, it is impossible to maintain sanitation. This applies also to the upper molars. We frequently find third molars erupting in malposition, partially impacted, and as they erupt, pressure is made on the alveolar plate, which causes resorption, and by the time that tooth erupts fully there is a deep pocket between the second and third molars. To my mind, this is one of the main reasons why we so often find pyorrhea pockets in that location. If we wish to do away with that pocket, we must remove that third molar, and vastly more good will accrue from its removal than from its retention under such conditions. When teeth have been extracted and the adjoining teeth have partially closed the space, generally speaking I believe it wise by orthodontia procedures to restore this space.

This is not a discussion of the etiology of pyorrhea, but I wish to emphasize—alluding to Dr. Van Loan's discussion—that to me it seems very plain that pyorrhea is not caused by any one factor. It is the result of a combination of factors, but, in the fewest possible words, it is infection of tissues whose resistance has been overcome. In a majority of cases, trauma is the cause of the breaking-down of resistance at that particular point where the infection has been established in an acute form, and the most common cause of trauma is malocclusion.

So important do I consider this factor that my first procedure in the treatment of pyorrhea is the correction of the malocclusion. It is worse than useless to perform a surgical operation upon tissues which continue to be exposed to stress. Such treatment would add to the injury, spread the area of infection, and render the formation of granulation tissue impossible.

Dr. Waugh (closing the discussion). The report as given has been a compilation of what others have said in answer to my questions, and while the ample discussion has raised no leading points for rebuttal, I feel that it will be only fair to allow me the privilege of briefly expressing my personal views on a few points, even though the time is short. The aim in formulating the list of questions was to remind ourselves of the gradual change that is taking place in the teeth and dental arches, with the special object of emphasizing the fact that this change reaches the minimum in proportion as normal occlusion is established and maintained. This involves not only all *restorative* operations, but forms the basis for all dental practice, including the treatment of those pathologic conditions which tend to weaken the support of the teeth in the jaws. These diseased areas, in the vast majority of cases, have their inception in trauma which is superinduced by malocclusion, and the primary cause of disease must inevitably be removed before the part may be restored to a state of health.

Normal occlusion has for many years been recognized by a few leaders as the basis of oral health and efficiency. The

wonder of it is that it has permeated the entire profession so slowly. Dr. Edward A. Bogue, when sending the answers to the questions, presented me with the reprint of a paper prepared by Dr. Isaac B. Davenport of Paris, entitled "The Significance of the Natural Form and Arrangement of the Dental Arches of Man, with a Consideration of the Changes which Occur as a Result of Their Artificial Derangement by Filling or by the Extraction of Teeth." This was read before the New York Odontological Society by Dr. Bogue, and published in the DENTAL COSMOS about 28 years ago.* This article contains the essential basic principles of normal occlusion, and should be read by all who are interested. There are perhaps many who have contributed to the knowledge of the subject as we understand it today, but to no one man, in my humble opinion, does the profession owe so much in this field as to Dr. Edward H. Angle. He proclaimed normal occlusion as "the basis of the science of orthodontia," and directed attention to the essential importance of the first permanent molars, aptly terming them the "key to occlusion." Dr. Angle's definition for occlusion is, "Occlusion is the normal relations of the occlusal inclined planes of the teeth when the jaws are closed." Could any definition be more simple and expressive? It does not imply an impractical ideal or a condition that may exist only in youth or at but one time in life. It means simply that the teeth meet their antagonists as nature intended, since only by this means is possible that mutual support and harmony of contact that is essential to the maintenance of health and efficiency of the dental organs. The definition applies as much to the teeth at sixty or forty as it does at twenty or at three years of age. We appreciate fully that abrasion of occlusal areas takes place as age advances, that it is much more marked in some individuals than in others, but the definition applies with equal force. If the inclined planes are within normal influence, the teeth and arches are guided to a definite, positive, normal, harmonious resting-place, without which the health and efficiency cannot be maintained for the greatest number of years. May I be permitted to urge upon all who have not already done so the serious study of the chapters on normal occlusion in Dr. Angle's "Malocclusion of the Teeth," 7th edition? It is my opinion that if local dental societies would take up as the next season's program a serious systematic study of normal occlusion, this would result in the greatest possible benefit to ourselves and our patients. It would serve as a stimulus to advanced study, and I believe there is still much to be learned about occlusion. We are apt to associate with it only the relations of the occlusal surfaces of the teeth, and perhaps the approximal contact points, but a deeper view leads to the recognition of its influence upon the positions of the roots in the jaws; the building of the alveolus for the support of the roots, the temporo-mandibular articulation and the normal histologic and anatomic make-up of the whole dental apparatus, without which normal function cannot be fully comprehended. And this knowledge of normal minute structure and normal function is essential to the most intelligent treatment of the part in disease.

In conclusion, I want heartily to thank the gentlemen who so generously prepared discussions upon the report. It was most gratifying to have so much accord and kindly expression. Naturally I had hoped for this when formulating the fifteen questions, but my fondest expectations were far surpassed, and I trust that as a result we have succeeded in proving that, if we would conserve the health and efficiency of the oral cavity for the greatest number of years, we must make "normal occlusion the basis for our individual daily practice of dentistry."

The next order of business was the report of the Committee on Practice, by Dr. D. H. SQUIRE, chairman, Buffalo.

* See DENTAL COSMOS for July 1887, vol. xxix, p. 413.

[This report is printed in full at page 872 of the present issue of the Cosmos.]

Discussion.

Dr. S. E. Davenport, New York. Much interest has been aroused in my mind by an examination of the "Reports on Practice" for the last eight years by the various committees in charge of that important department of the work of the Dental Society of the State of New York.

During those years the committees have been headed by Drs. Wm. B. Dunning, Arthur H. Merritt, F. P. Hamlet, W. D. Tracy, and for the last two years, Daniel H. Squire. The excellence of these reports is explained and accounted for when the above list of chairmen—than whom this society possesses no more earnest students and no better clinical practitioners—is noted.

My opinion is that these Reports on Practice, as complete and dependable as they are—being the result of much thought and generous reading on the part of the various committees having them in charge—do not receive the attention they deserve by simply being read and discussed here, and then printed in our proceedings. There is not in existence a history of the progress of dentistry for these recent years equal to these combined reports, and no better use of society money—if we had any—could be made than to publish them collectively in a pamphlet for distribution among the younger members of the profession, particularly to those just graduating from dental colleges.

For a number of years the discussion of these Reports on Practice was excellent, showing careful preparation, resulting in much added emphasis and thoughtful comment to the scholarly reports of the committees. Last year I thought the discussion less successful, even though those who took part in it were men of the highest class, and I wondered whether a comment by Dr. W. S. Rose of Schenectady, who opened the discussion, might not afford some explanation. Dr. Rose began his remarks with the words, "Although the report of the Committee on Practice came into my hands but yesterday." There are dentists, of course, who can talk entertainingly and instructively concerning a report they have had no opportunity to study, but I am not one of them, and I am sure that no man can do himself full justice without having had at least a moderate amount of time to prepare his contribution. My desire is not to criticize the committee, but to call attention to the excellence of these reports, prepared with so much care, and to deplore the fact that the plan best calculated to bring forth a discussion worthy of the report is not followed. When Dr. Wright complimented me by inviting me to be one of those to discuss this report, I requested him not to announce my name unless I could have a copy of the report at least two weeks before this day, as I had plans and engagements which would prevent me from giving it any attention the last few days before this meeting. The date of this writing is May 7th, and as yet no report has reached me. I have also learned that one of those announced to discuss this subject is not present because he could not secure a copy of the report in time to prepare a discussion satisfactory to himself.

Dentistry really seems to be coming into its own; to be gradually receiving the recognition it deserves. Oral hygiene, prophylaxis, and other preventive measures are everywhere making way, and their value is becoming established in the minds of the people. Public clinics are everywhere, dental examiners for school children are quite common, no hospital of any size is complete without its dental intern and corps of part-time workers, volunteer or paid, and many of the large corporations and great department stores, where men and women are employed, have dentists who are paid to serve the employees, usually without fee.

For years dentists have grieved over the fact that physicians either failed or declined to recognize them as professional brothers—many papers and dis-

cussions having been devoted to plans and suggestions for bringing about a closer professional intimacy between physicians and dentists, who really had, or to the dentists seemed to have, so much in common. Now all is changed, for since Dr. Hartzell and others have so conclusively demonstrated the connection between the mouth-grown pathogenic germs and the various forms of arthritis, through secondary infection, the physician and the dentist are working together, as they ought to have been working before, and the physician is really beginning to learn something about the teeth as well as about the possibilities of dental service as a corrective for systemic ills.

Appreciating the danger to the whole system of allowing diseased teeth to remain in the mouth, I fear a too radical turning toward extraction as a remedy rather than the application of such methods of healing as we possess for the retention of teeth which can be made healthy and useful. The average physician places small value upon a tooth, and in collaboration with him we need to stand firmly for the preservation of such teeth as in our opinion would, after treatment, be a help and not a menace.

The justly prominent American dentist of London, Eng., who fell dead from rupture of the aorta in March last, was fulfilling his duty to mankind and to his profession up to the moment of his death, for he was at the telephone talking with a physician about a patient they were both serving, and his last words were, "I shall insist that those teeth be preserved."

Any report of the progress in dental practice for the past twelve months would be incomplete if it did not include some reference to the prominent part which dental surgery has been playing in the military hospitals of Europe. Never before have dentists contributed so largely to the relief of the wounded, and I believe this to be the first war in which dental surgeons in any hospital have taken complete charge of practically all wounds in and about the buccal cavity. This situation has been, perhaps, best illustrated in the American Ambulance at Neuilly, Paris, where Drs. Geo. B. Hayes and Wm. S. Davenport, dental and oral surgeons to the hospital, assisted by Dr. Wm. H. Potter of Boston and others, have accepted the responsibility of caring for all wounds of that character.

Dr. C. Winchester Dubouchet, formerly of Baltimore, who is in official charge of the American Ambulance, his associate, Dr. Joseph A. Blake, formerly of the Presbyterian Hospital, New York City, and the other general surgeons, unite in according the highest praise to the dentists on the hospital staff for their efficient and successful work, it having been not merely auxiliary service but a masterly acceptance of responsibility for the full care of a class of wounds, including fractures of the jaw, which have been so difficult usually for the general surgeon. The great amount of fighting from trenches has resulted in a considerable proportion of wounds of the mouth, teeth, and jaws, which dental and oral surgeons are trained to treat. While official records of the results of dental service at the American Ambulance are available, lack of time causes me to refrain from quoting from them in this discussion, and I will only add that in relief work near the firing-line, as in private practice in our offices, the practice of dentistry has made distinguished progress during the past year, and that we may truly say that hereafter no well-equipped military hospital will exist without its department of dentistry. All honor to these distinguished American dentists, whom I have mentioned by name—all members of the First District Dental Society, by the way—who have for months neglected their private patients for the purpose of rendering voluntary service of so high a character to those poor suffering wounded men of all nations.

Dr. G. H. Shannon, Cambridge. We have all listened with a great deal of benefit and pleasure to the report of the chairman of the Committee on Practice, and have heard a clear, concise, and conservative *résumé* of the more prominent

matters of interest in the year's work of the profession. The report devoted a few well-deserved lines to Spence's plaster, which seems to deserve more consideration from the profession than it has had, and should be thoroughly tried out by everyone.

Having used this plaster ever since it was first brought out by Dr. Spence, I consider it indispensable, though on first acquaintance it is an obstinate material to work, and one is inclined to discard it as impossible. But when its use is mastered, a model can be prepared from it in forty minutes or less which will be entirely safe to build trial bite plates upon, and if it is allowed to harden thoroughly, the final swaging of a gold plate, using only the press, and not the hammer, is entirely practical. The directions for its use, of course, should be carefully followed.

With reference to controlling the shrinkage of rubber during vulcanization, we should not forget to mention Greene's metal forms in forming our model. When a metal form, bent to conform to the teeth when waxed up, is placed over the teeth while pouring the female part of the flask, the crowns of the teeth come in contact with the metal form and are held more firmly in place; distortion during vulcanization is more thoroughly controlled, and the articulation is more securely maintained.

Amalgam as a filling material, its application and technique as cited, deserve thorough mastery and trial; it will undoubtedly render unnecessary and criminal the placing of a large per cent. of gold crowns, with the inherent horrible mutilation of the teeth and gingival margins, the ultimate result of which is pyorrhea and total loss of the abutment tooth.

Of the great value of radiography both to the practitioner and patient there can be no longer any doubt. But until the medical and dental professions together recognize more fully the menace to general health from unclean mouths, carious teeth, and the innumerable pathogenic micro-organisms harbored therein, which work havoc with the more remote parts of the body, and realize that something less contemptuous than "only a tooth" is involved; and until, perhaps, in the next two hundred years, the code of ethics will be so understood and interpreted by the organized profession as to allow the man in the street to be reliably informed in these matters, the ordinary practitioner in the small city or village will have no call for radiography, because, not knowing its value, the patient will not pay for it, and the dentist, of course, cannot maintain the service.

With reference to emetin hydrochlorid, Barrett and Bass and Johns have not, as far as I understand, made a distinct claim that it will by itself cure pyorrhea, but only that it is a perfect amœbicide, and so far as the endamœba buccalis is responsible for any phase of pyorrhea, that drug is a specific.

A very distinct line should be drawn between the claims of these investigators and the claims made by the manufacturing chemists.

If, as many are claiming, emetin cured pyorrhea, it would become utterly unnecessary, so far as pyorrhea is concerned, to remove the mucous plaques and fungoid growths from the gingival margins and interproximal spaces by prophylactic treatment; and we would have to admit—which I am utterly unprepared to do—that abraded gingival surfaces, irritating rough, sharp edges of tartar on the teeth or root surfaces, or the wounding or obliteration of the papillæ by malposed teeth do not furnish opportunity for infection and reinfection by the various well-known pathogenic organisms inhabiting the oral cavity, and that reinfection from this source is a negligible factor in the treatment of pyorrhea.

If I am correctly informed, the usual laboratory tests have not been made to prove that the endamœba buccalis is the specific cause of pyorrhea—*i.e.* that from a typical case of pyorrhea the endamœba buccalis has been isolated, a pure culture made, and from that culture, in a perfectly healthy tissue, pyorrhea has been produced by inoculation;

—and until that has been done, had we not better go slowly?

This treatment has been most enthusiastically and I believe ill-advisedly heralded throughout the medical, dental, and lay press as specific. An article has appeared in the Sunday issue of a great metropolitan daily, over the signature of an M.D., written in a very light vein, the people being practically told to purchase a hypodermic syringe, inject themselves once a day for three or four days with emetin hydrochlorid, and be cured! Is it not high time for the profession to insist publicly that it be taken more seriously, and that we refuse to be rushed into a position that may be found untenable?

The chapter on pyorrhea in this report can mean only one thing, namely, that our operative technique be so changed that it will exclude the rubber dam and its ligatures, the gold crown that is jammed up beneath the gum to hide the "fit," the amalgam fillings which encroach upon the interproximal space, and all operations in a field not rendered aseptic.

There is hardly a limit to which we may go in the discussion of the individual items of this paper, but there is one phase upon which I would insist. Someone has said that "the effective way to think is in terms of the whole," and as we look at this paper as a whole, and realize that it is almost altogether confined to scientific items having for their basis the microscope and the test tube, and compare it with a report on the same subject of thirty years ago, which was devoted almost wholly to mechanics, we have the measure of the distance which the profession has advanced. We must, however, not forget that the very *raison d'être* of the profession is its gain in knowledge and ability which shall be not only appropriated by us as individuals but shall be applied for the benefit of humanity, and when it is remembered that only a small percentage of humanity is actually benefited by our efforts, we should be startled by the large number of the unattended, which is the measure of our failure as a profession. For a man or a machine that leaves fifty per cent. of work undone is classed as inefficient, and our first duty seems to be to render our profession effective. The power to gather and classify so much information for our use as individual practitioners implies an ability for completion of the work for the full benefit of humanity.

In closing, let me read what, to my mind, is the gem of the report—*i.e.* "The value of the microscope and bacteriologic technique in the diagnosis of oral lesions is being recognized to a considerable extent, so that altogether the dentist is no longer a man of haphazard chance." The smooth silkiness of this phrase should not blind us to the subtle warning it contains, and woe unto us if we do not heed it; for men like Hunter, Osler, and Mayo are using the lens, and have shown and should show us no mercy.

Dr. C. H. Thompson, Goshen. There are one or two points in the paper which appeal to me particularly, and one of these was the use of emetin. We may or may not be getting at the basis of pyorrhea, but these investigations and efforts, whether they prove the value of this particular agent or not, are worthy of our consideration, and the men who are following out in their research work these methods in an attempt to discover the true basis of pyorrhea deserve not only our hearty support, but also great credit and consideration for the work which they are doing. In my practice I have been using emetin for several months, not only following Bass and Johns', but also Smith and Barrett's methods. In comparing cases of similar conditions of gum recession, I have found that the method used by Bass and Johns, viz, the intramuscular method of injection, gives more beneficial results. I have never attempted the treatment of cases of pyorrhea without spending hours in instrumentation before applying emetin, and I attribute a vast amount of the beneficial results obtained purely to the instrumentation. The intramuscular method of injection in my

experience has produced more marked and quicker results than the placing of emetin directly in the pockets, apparently owing to the fact that we do not know when we get all pockets properly flushed. The latter method, therefore, has proved in most cases to be a failure in my hands. One of the most beneficial and quickest results from the use of emetin is the stopping of the bleeding of the gums.

One of my patients has been suffering for some time from a derangement of the stomach, and was undergoing treatment for pyorrhea, and after the second injection of emetin his stomach trouble ceased. This may be a coincidence, but it struck me as being a very peculiar one. I would like to have the essayist answer this question: In some cases treated by emetin I have observed swelling of the submaxillary glands, and I would like to know the significance of that observation.

Dr. J. O. McCall, Buffalo. My specialty makes me more interested in that part of the report which deals with emetin than with the other portions, and I wish to call attention, perhaps in a little different way from the essayist, to some pertinent items. For a good many years we have all realized that the pus in pyorrhea cases was produced by the presence of micro-organisms, and the natural treatment consisted in injecting some agent into the pockets which would destroy the micro-organisms. This treatment, however, has not yielded the desired results, at least without mechanical treatment, such as scaling and polishing of the roots and relief of malocclusion, etc. This observation points to the fact that emetin may be of great value, but we cannot hope to obtain results from that drug alone. We must realize that in the treatment of this disease there is always a tendency on the part of the dentist to get away from the laborious mechanical treatment, from the acquiring of the technique which is necessary to secure perfect mechanical results, and I feel that the dental profession is going to suffer a great disappointment from emetin or ipecac treatment on this very account. On the other hand, I know that very good results can be obtained without it, and yet I am not ready to say that it is not of value. But I do not think that we should put too much reliance in this drug, until we have had the chance to investigate it more thoroughly and in a truly scientific manner. We must remember that the invasion of the tissues by micro-organisms has been claimed by all investigators to depend upon a primary mechanical injury to the soft tissues. Pyorrhea alveolaris is really a protean disease, not due to any one but to several causes, and we must strive to take care of these causes, whatever they may be, in the order of their importance. I believe that there is some value in the emetin treatment, because there is no question that in a great majority of cases there is considerable improvement when emetin is used, even without any mechanical treatment, but I cannot get away from the feeling that the treatment should consist in the removal of mechanical irritants, as well as treatment by drugs.

Dr. F. W. Low, Buffalo. Before making any remarks on any therapeutic agent, it has been my habit for a number of years to try it on myself. I have submitted to five hypodermic injections of emetin, not because I suffered greatly from pyorrhea, but because I felt it my duty to my patients to know how much inconvenience they might suffer from the administration of emetin.

Through a combination of circumstances my teeth had not been prophylactically treated as formerly, and it was over three months since the last treatment, when my mouth was examined to determine the presence of amœbæ. Dr. Moss, in the presence of several of my friends, found amœbæ present around the necks of my teeth, and demonstrated them under the microscope. There is no question about the amœbæ being alive. Dr. Moss tells me that the protozoa not only are alive, but that in pyorrheal teeth he finds pus cells in the peridental membrane, and below that tissue amœbæ, which he has also found in the bowels. Three weeks after I had taken the injections, I had a re-examination

made, and there were no amœbæ present. At the recent state medical society meeting in Buffalo, Dr. Stewart of Philadelphia, an eminent medical man, read a paper on this subject, and I asked him, in closing the discussion of his paper, to tell me how long I might hope to remain immune, and he replied, probably three weeks. Of course, I do not intend to submit to hypodermic injections every three weeks. I have used as many as sixty of the half-grain tablets, and I believe I have materially relieved conditions, that is, the symptoms of discomfort did not recur, whereas these had usually recurred two weeks after I had finished prophylactic treatment. One patient has had thirteen injections of the bromid of emetin in the muscles of the abdomen. When he called for prophylactic treatment, instead of giving him the regular prophylactic treatment, I prescribed injections of emetin, and when the patient returned at the next appointed time for prophylactic treatment, I noted a very marked improvement and a more healthy condition of the tissues.

Dr. Squire (closing the discussion). Concerning the conclusions drawn in the report with regard to improved technique of the general practitioner, it surely occurs to every man in general practice that he has to improve his technique. Perhaps the greatest criticism of the specialist in pyorrhea is that we are not careful, that we do not take care of our gingival margins as well as we should, that we produce unnecessary laceration of the soft tissues. Dr. Black has proved, after careful tabulation of the effect of working on the soft tissues, that we produce a great deal of mutilation, and he has shown in his report that ninety per cent. of the pyorrhea cases observed were produced by the general practitioner's poor technique. I drew this conclusion because I could not draw any other, and because I am not an investigator I had to be governed by the work of the men who have made researches in this field.

In regard to infection of the submaxillary gland, I can only repeat what others have told me in regard to infections of other glands after the injection of emetin; that is, that it must be due to some fault in our technique of administration.

The meeting then adjourned until 8 P.M.

(To be continued.)

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Devoted to the Interests of the Profession.

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EDITORIAL DEPARTMENT.

THE FOUR YEARS' CURRICULUM.

THE evolution of professional sentiment favorable to the more efficient training of practitioners of dentistry in order to meet the enlarged scope of activity which now characterizes modern dental practice became definitely crystallized into formal recommendations by resolutions passed by the Educational Council of the National Dental Association, confirmed by the governing body; the National Association of Dental Faculties, the National Association of Dental Examiners, and the Dental Faculties Association of American Universities, respectively. Taken collectively, the approval of these representative organizations may be regarded as definitely expressing the approval of the whole dental profession of America of an important advance step in dental education. We have contended in the past that dental education could advance no farther nor more rapidly than it is sustained by a general sentiment among the dental profession favorable to such advance. A pre-

vious effort to increase the length of the standard dental curriculum failed of practical fulfilment for the very reason that it lacked general professional support—for the need which even then existed was not generally recognized; hence, after a brief trial of one academic year, the four years' course was abandoned.

In the meantime fundamental changes have taken place throughout the dental profession with respect to the basis of dental practice, and what amounts to a revolution of thought with respect to what constitutes dental practice has taken place. The indictment by Hunter of Liverpool of the responsibility resting upon the ignorant or careless crown-and-bridge worker for a variety of bodily infections; the further unfolding of the relation of various focal infections to septic apical conditions of tooth-roots resulting from imperfect and careless canal work; the immense importance attaching to oral uncleanliness as a source of bodily disease or chronic ill health, and the immediate causal relation which the unhygienic mouth bears to dental caries itself, have collectively compelled attention not only to the necessity of improved prosthetic and operative technique, but have demonstrated the necessity for a more thorough education of the dental practitioner in the principles of medicine, especially in pathology and its related subjects, in order that he may be fully competent to not only relieve the conditions arising from infections of the dental and oral tissues, but what is of greater importance, be competent to prevent their occurrence.

It is the general recognition of this enlarged requirement in dental education that has, we think, gained for the lengthened curriculum the support of the whole dental profession. When the four years' course was temporarily adopted some years ago, the factors which today render it practically imperative were not clearly understood nor appreciated, except by a minority of dental educators; hence, at that time, the lengthening of the curriculum was interpreted to mean simply more time to do the work of the standard course then in vogue—no expansion of the course in a strictly educational sense was contemplated, for the reason that the need for a broader, more comprehensive curriculum to meet conditions such as now present for solution did not exist; and herein rests the distinguishing difference between the old abandoned four years' curriculum and that con-

templated under the recent concerted action of our representative national professional bodies. The present proposed four years' curriculum is not a new departure solely in the sense that it contemplates an extension in time of the old three years' curriculum; it is much more than that, in that it represents a broader and higher cultural efficiency. It may be taken for granted that the educational possibilities of the new four years' course will not be fully developed at its inception. *Festina lente!* must be the governing principle, and the best practical results be reached through experience in the utilization of the additional time. The first step has taken time for its achievement, but now that the added year has been authorized, the more important problem of its effective utilization is to be solved.

We have already published, in our May issue, the schemes for a disposition of subjects embraced in the four years' course as tentatively approved by the Dental Faculties Association of American Universities. On June 25th, at the call of the president of the University of Illinois, a meeting was held in Chicago at which were represented the Universities of Illinois, Minnesota, Ohio, Pennsylvania, Pittsburgh, Iowa, and Michigan, Northwestern University, and Washington University, at which meeting the action taken by the several national dental bodies favorable to a four years' course was approved, as also that the new course go into effect beginning with the session of 1917. The question as to how the four years' course should be utilized was divided into three subsidiary ones, as follows: Shall the four years' curriculum consist of—(1) Four years of strictly dental study? (2) One year of academic work and three years of strictly dental study? Or (3) One year of prescribed preparatory study and three years of strictly dental study? After full discussion of these several plans the following resolution was adopted:

> Resolved, That it is the sense of this meeting that we approve the plan of a four years' course of not less than 4800 working hours, the curriculum to consist of not less than 4200 hours devoted to such subjects as are deemed essential to the technical and scientific education of the dental practitioner, with the understanding that ancillary subjects shall be elective and not consume more than 600 hours of the course.

It will be seen that the foregoing general arrangement permits a reasonable latitude for the introduction of subjects collateral to

the strictly technical subjects of the course, and provides for the strengthening of its cultural efficiency.

All have felt the need for a cultural element in the dental curriculum that will improve the ideals and ethical tone of the student. While that important and desirable result may be attained to a degree by the introduction of strictly so-called cultural subjects into the curriculum, it is certain that the data of the course itself will furnish to the true teacher all of the groundwork necessary upon which to build the highest ethical ideals and cultural development needed by the student, provided always that the dental teacher is really a teacher.

Pennsylvania, Ohio, and Illinois have legally confirmed the four years' curriculum, as has also the Province of Alberta, Canada. It is now pertinent for all of the states of the Union to legally recognize this advanced step in dental education, and thus secure to the general public that higher type of dental service which modern society rightfully demands.

Bibliographical.

Lehrbuch der Grenzgebiete der Medizin und Zahnheilkunde. [Text-book of the Border Fields of Medicine and Dentistry.] Edited by Dr. Julius Misch, Berlin. With 402 partly colored illustrations, 1017 pages. Price, Mk. 36. Stuttgart: F. Enke, 1914.

Dentistry, or rather stomatology, has hardly produced a more monumental work than this volume, and by way of anticipation it may be proudly pointed out that the scientific progress of modern dentistry could have not been attested to by a more complete and authoritative document. The co-operation of Prof. Dr. O. Büttner, Rostock; Prof. Dr. E. Fuld, Berlin; Prof. Dr. A. Gutmann, Berlin; Dr. E. Herzfeld, Berlin; Dr. F. Kölsch, Munich; Privy Councillor Dr. H. Kron, Berlin; Privy Councillor Dr. R. Ledermann, Berlin; Dr. G. Lennhoff, Berlin; Dr. H. Mühsam, Berlin, and Dr. G. Tugendreich, Berlin, is a fair guarantee for the superior character of the presentation of each special subject, all of which are treated from the special point of view of their possible utility for dental science, and the editor's (Dr. Misch) really gigantic task of correlating apparently purely medical diseases with the practical dentist's task has been brilliantly solved. His familiarity with dental literature as it relates to general medicine is almost phenome-

nal, and case histories which have heretofore been scattered over the world's medical and dental literature are here brought into convenient focus for that dentist who would be more to his patients than a mere "dweller in dental cavities." He who considers himself a called "guardian of the gateway of the human body" will find in this volume broader vistas—in fact, almost unthought-of possibilities of his usefulness, hence invaluable encouragement toward more comprehensive service to humanity. Of course, the narrow advocate of dentistry as a purely mechanical art will knit his brow at such almost unlimited excursions into the medical field, but if dentistry is to heed Dr. Mayo's famous call to concerted action, and to accept his challenge to become the standard-bearer in the battle against disease, it can hardly find a better catechism for the soldier of the cause of health than this volume. With the liberal amount of theoretical medical training which the dental student is receiving today and will receive to an even greater extent when the four years' course shall have become universally adopted, every one of the chapters presented is perfectly comprehensible to the dentist, who very frequently is the first to recognize in his particular field of observation symptoms which point to serious systemic disorders. While it lies manifestly outside the dentist's domain to treat internal, nervous, skin, women's, ocular, aural, pulmonary, or cancerous diseases, yet his co-operation with the medical specialist can only aid in bringing about a reliable diagnosis, prognosis, and course of treatment to the patient's material benefit, and contribute essentially to a definite removal of the misconception ingrained in many a medical mind that the "D.D.S. degree is a token of only partial culture." When viewed from this angle, the present volume is to be sincerely welcomed as a pioneer work of imposing dimensions in the combating of false prejudice, and enlightened *rapprochement* of two professions which for all intents and purposes are but one.

The all-embracing scope of this volume may be superficially indicated by the large chapter headings of internal, children's, nervous, skin, syphilitic, women's, ear, nose and throat, ocular, and occupational diseases, the subheadings of but one of which will attest to the comprehensive treatment of each special topic. On 116 pages of text, children's diseases in their relationship to dental disorders are treated under the following subheadings: Anatomy and physiology, nursing, oral fluid, dentition, congenital teeth, premature eruption, normal first dentition, first dentition and children's diseases, congenital deficiency in teeth, aberration of tooth-germs, second dentition, relationship of children's diseases to dental and oral diseases, rhachitis, spasmophile diathesis, tuberculosis, scrofulous and exudative diatheses, hereditary lues, Barlow's disease, acute osteomyelitis, acute infectious diseases, chickenpox, measles, scarlet fever, German measles, diphtheria, adenoid growths; catarrhal, gonorrheal, aphthous, and ulcerous stomatites, thrush, noma, gangrene; diseases of the tongue, malformations (cleft palate and hare-lip), oral hygiene in infancy, thumb-sucking, anesthesia in infancy.

The technical make-up and the abundant illustrative material, which contains many reproductions in natural colors, are of the highest order.

R. H. R.

DORLAND'S AMERICAN POCKET MEDICAL DICTIONARY. Edited by W. A. NEWMAN DORLAND, Editor "American Illustrated Medical Dictionary." Ninth Edition, revised and enlarged. Flexible leather, gold edges, $1.00 net; with thumb-index, $1.25 net. Philadelphia and London: W. B. Saunders Company, 1915.

Although the entry-words which the Pocket Dictionary defines are printed in a liberally bold type, and the definitions are sufficiently full for the purposes of a *vade mecum,* yet by judicious typography this ninth edition of Dr. Dorland's *multum in parvo,* without departing from "pocket" size, is comprised within less than 700 pages. The paper has been well chosen for relative opacity, and the presswork is excellent;—so that the inclination to take the book into the hand which arises at sight of its tasty cover of flexible red leather—befittingly redolent on olfactory diagnosis—is not succeeded by any dampening of esthetic pleasure upon examination of its printed pages.

The intrinsic utility of this implied epitome or skeleton of the healing art—with its included tables of the arteries and the muscles, the thermal scale equivalents, weights and measures with metric equivalents, dosage, etc.—is sufficiently attested by the demand for a ninth edition, 70,000 copies having been previously sent forth. The dental definitions are to be commended. It only remains to congratulate the editor and his publishers on the manifest professional appreciation which continues to reward the efforts they have expended in the production of this admirable little volume.

REVIEW OF CURRENT DENTAL LITERATURE.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Deutsche Zahnaerztliche Wochenschrift,* Berlin, May 8, 1915.]

HYGIENE OF THE OPERATING CHAIR.

By ZAHNARZT WEIDNER, COLOGNE.

Weidner makes some very patent remarks concerning the average dentist's stepfatherly treatment of the operating chair, which is so essential for comfortable and successful work. He decries the ease with which dust collects in chairs which are constructed without regard for the avoidance of corners. Cane seats and backs, or those of artificial leather, in his opinion, are far preferable to velvet upholstery for reasons of comfort and hygiene, and the former can be easily repaired by any upholsterer. The simplest head-rest is the most practical, as long as it is soft and washable. For preventing the transmission of infection or parasites, linen cloths to be renewed for every patient are the most satisfactory so far; there is ample room, however, for cheaper and more practical substitutes. The arm-rest also deserves careful attention, and should be covered either with wood, or better, with a light material such as white enamel or porcelain, which can easily be kept clean. White enamel or porcelain, moreover, in summer has the advantage of feeling cool. All washable portions of the operating chair should be washed daily with a one-half per cent. lysoform solution in warm

water, and at longer intervals of time with ether, benzin, or benzol to cut the fatty deposits. While cleaning or dusting the operating room, the chair should always be covered to prevent deposition of dust.

[*Journal of the American Medical Association*, Chicago, December 5, 1914.]

A STUDY OF THE BACTERIOLOGY OF ALVEOLAR ABSCESS AND INFECTED ROOT-CANALS. By Dr. T. L. Gilmer and A. M. Moody.

MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASE. By Dr. F. Billings.

MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASE. By Dr. C. H. Mayo, Rochester, Minn.

MOUTH INFECTION AS A SOURCE OF SYSTEMIC DISEASE. By Dr. E. C. Rosenow.

PERIDENTAL INFECTION AS A CAUSATIVE FACTOR IN NERVOUS DISEASES. By Dr. C. B. Craig, New York.

This imposing symposium on oral sepsis, which was held by the Section on Stomatology at the sixty-fifth annual session of the American Medical Association, Atlantic City, June 1914, is a fair proof of the importance which the medical profession has come to attribute to oral disorders in the causation of general disease.

Gilmer and Moody, in contradiction of the generally held view that staphylococcus albus and aureus are the chief causative agents of acute and chronic abscesses, have made 40 serial examinations of material taken from 16 acute alveolar abscesses, 18 subacute or chronic abscesses, and 8 teeth with diseased pulps. The microscopic examination of the aerobic growths revealed many graded variations of the predominating streptococci, viz, from a hemolytic streptococcus with a wide zone of hemolysis in the acute cases to a streptococcus viridans in chronic cases, also one in which a streptococcus mucosus was the predominating organism. These organisms in many instances were found to grow anaerobically as well as aerobically. Some anaerobic cultures of streptococci contained the bacillus fusiformis in varying numbers, a few tubes having the bacilli in almost pure culture. Occasionally in the aerobic cultures isolated colonies of staphylococcus aureus or albus, micrococcus catarrhalis, and some unidentified saprophytic organisms were found. In three old anaerobic cultures from abscesses, a black pigment-producing organism was observed, which, however, was not held to be pathogenic.

In three chronic cases, autogenous vaccines were prepared from both aerobic and anaerobic cultures, and were administered at five days' intervals, with strikingly beneficial results.

Attention is called to the occurrence of epidemic alveolar abscesses, and to the reasonable supposition that they may bear a definite relationship to the same epidemic diseases of the nose and throat.

Conservatism is urged in the extraction of teeth, which is to be decided upon only after proper interpretation of a properly made radiograph. Some abscesses, it is justly pointed out, may be cured by treatment through the roots of the tooth, others by surgical means rather than by extraction. Pus appearing around the free margins of the gum does not always indicate pyorrhea alveolaris, but may be cured by the removal of calcarious deposits.

Billings advises thorough diagnosis of alveolar infection by radiography, and points out that while general systemic conditions may cause mouth infection and alveolar disease, alveolar infection may be the dominant factor in the production of malignant endocarditis, chronic arthritis, and myositis. The streptococcus-pneumococcus group apparently comprises the important pathogenic bacteria related to systemic disease, and such systemic disease, due to focal infection, is probably hematogenous, resulting in embolism of small and terminal arteries, causing ischemic hemorrhage and endo-arterial proliferation, resulting in interstitial overgrowth, cartilaginous, osseous, vegetative, and other morbid changes, dependent on the tissue infected.

Team work by medical and dental specialists is required in the investigation and management of these patients.

Mayo points out that infections which produce the greatest number of diseases enter the system through the alimentary and respiratory tracts, and that the great importance of the well-known diseases of the nasal passages with their sinuses, the lymphoid tissue of the pharynx, including the tonsils, and

the diseases of the gums and teeth, is now more generally appreciated. Contrary to current belief that the gastric juice destroys bacteria, Smithies has shown that bacteria, pus-producing organisms and bacilli, often of the colon group, as well as leptothrix buccalis, thrive in the stomach. Acid-bathed or acid-secreting surfaces are easily subject to cancerous change, while alkaline-bathed surfaces are much less liable to be involved. The infected mouth shows a tendency to acid reaction, and it is through this acid change that we have an additional danger in cell degeneration of a malignant type from irritation. A more effective school inspection by competent men is urgently advocated.

Rosenow has found that the organisms in some of the more chronic infectious lesions are quite different from the organisms found in the focus of infection at the same time; this, however, does not minimize the importance of the focus of infection in any way, as the organisms in the tissues may have undergone a change, which fact would modify the action of an autogenous vaccine made from the focus, as it would not contain the proper antigens. The focus of infection is to be looked upon not only as the place of entrance of the bacteria, but also as the place where the organisms acquire the peculiar property necessary to infect. While the mouth is probably the most common source of infection, yet one should look farther. To find the causative focus of infection, not only the stomatologist, but the general practitioner and surgeon, should be consulted.

Craig thinks that the reasons why peridental infection is not more disastrous are, first, that the pus usually has free drainage into the mouth; second, that the body tissues establish various degrees of immunity against a continuous bacterial intoxication. No portion of the nervous system seems to be especially susceptible to the toxin of peridental infection, but the most common manifestation seems to be paresthesia in the fingers and toes. The "pins and needles" sensation and neuritis of the large nerve trunks has cleared up after disposing of alveolar disease. The continual swallowing and absorption of pus often leads to digestive disorders with anemia, which state of exhaustion is often associated with a state of melancholia. The four cases of nervous disorders of dental origin cited bear out in some respects Dr. H. S. Upson's observations on "Insanity Caused by Painless Dental Disease," published in the DENTAL COSMOS, May 1910, p. 526.

[*Revista Dental*, Habana, November 1914.]

ANEURYSM OF THE INFERIOR DENTAL ARTERY. By Dr. C. V. COURBIS, CHILE.

Referring to a case of extraction of a lower molar with lethal result, reported in the *Revista Dental Argentina* by Dr. Etchepareborda, Courbis inquires into the subject of aneurysms, those most dangerous because not readily recognized foes of the anesthetist, which are divided into three classes, viz, arterio-venous, cirsoid, and arterial. In regard to etiology, an aneurysm depends upon the destruction of the tunica media, the elastic and contractile coat of bloodvessels, which supports the pressure of the circulating current. This pathological condition of the vessels may be due to chronic arteritis, or to causes producing the same, such as arthritism, alcohol, syphilis, chronic malaria, and infectious arteritis.

At a glance, an aneurysm of the inferior dental artery may be confused with an inflammation due to advanced caries. Its differentially diagnostic symptoms, however, are a soft and compressible tumor, movement synchronous with the pulse, expansion, which is pathognomonic of an aneurysm, partial reducibility. Aneurysms are not painful *per se*, their growth is usually slow, and they are characterized in the mouth by spontaneous loss of blood, periodical or persistent, at the level of the diseased region, or at the gingival border of teeth whose roots extend to the diseased portion of the artery. The disease more or less rapidly assumes enormous proportions, owing to the pulsations of the aneurysm, which by its growth produces rarefying osteitis. These hemorrhages are distinguished from those in hemophilia by the sudden and brusque flow of blood, which produces pallor, nausea, cold sweats, irregular and rapid respiration, and tendency to syncope, which brings about hemostasis or fatal convulsions. The radiograph is invaluable in diagnosing the condition and guiding the surgeon's hand.

As to treatment, ligating is of little value. Injections of gelatinous serum have been successfully used. In case of an aneurysm of the intra-osseous portion of the inferior dental artery, resection of the mandible in the af-

fected region, followed by immediate prosthesis, is indicated.

[*The Bur*, Chicago, January 1915.]

A REPORT OF EXTRACTIONS, COVERING A PERIOD OF SIX YEARS. By Dr. A. H. Lemke, Wausau, Wis.

This most commendable record, which covers a period of six years, gives valuable data regarding the frequency of carious destruction of the various teeth, and is worthy of emulation by every dentist. The writer's results are systematically tabulated, and bear weight, because he affirms his reluctance to extract a tooth if it can be saved.

An analysis of the diagram shows that the molars are removed far in excess of the other teeth, numbering in the writer's experience 233 on the right, and 265 on the left side. Of upper right molars 129, upper left molars 117, lower right molars 104 and lower left molars 148 required extraction. Of upper anterior teeth, including bicuspids, 270, of lower anteriors 155 were extracted, showing an almost 2:1 ratio of upper and lower anterior teeth, while the number of upper and lower molars, 246 and 252, is about equal. Taking the median line as the dividing point, 287 extractions concerned the upper right, 229 the upper left, 181 the lower right, and 226 the lower left sides; hence the most teeth were removed from the upper right, the least from the lower right side, while the left upper and lower sides were almost equal. Altogether 516 upper and 407 lower teeth were removed.

The bad condition of the molars is attributed to lack of oral hygiene in childhood, rendering later conservative treatment impossible in many cases. The lower anterior teeth retained exceed the upper by approximately 50 per cent. The number of extracted third molars is about one-half of that of second molars extracted, while the number of extracted first molars exceeds that of second molars from one-fifth to one-third.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

Section I.—*Dental Anatomy, Histology, and Physiology.*

THE FERMENTATIVE ACTION OF THE SALIVA AND ITS RELATION TO DENTAL CARIES. By Prof. Dr. Michel, Würzburg.

The writer essays to prove that caries can develop only in a mouth in which the saliva has a saccharinifying action upon macerated or boiled starch. He tends to prove this by the observation that in a series of animals whose salivary enzyme saccharinifies little or not at all, immunity to caries is always found, and by his demonstration that the frequency of caries in man stands in direct ratio with the saccharinifying power of the ptyalin.

Section II.—*Dental Pathology and Bacteriology.*

CALCIUM METABOLISM AND DENTAL CARIES. By F. W. Broderick, M.R.C.S., L.R.C.P., L.D.S.Eng., Bournemouth.

The essayist maintains that dental caries is due to the solution of enamel by organic acids, produced by fermentation of carbohydrate food substances around the teeth.

If the saliva be sufficiently alkaline and in sufficient quantity, this acid will be neutralized at the moment of formation, and no caries can occur. Alkalinity of saliva is due to inorganic alkaline salts, of which the most important is calcium carbonate in solution as a bicarbonate.

Utilization of calcium in the body is regulated by the ductless glands working one with another, some being absorbers of calcium, others eliminators.

Calcium in the body is found in two forms —(*a*) Fixed in the tissues, and (*b*) Floating, *i.e.* waiting to be utilized as required either as (*a*) or for repair purposes.

If calcium elimination is increased or absorption is diminished, the floating calcium will first be affected, and a low calcium rate be the result. Later the fixed calcium may become broken down and eliminated—osteomalacia.

The suprarenal, pituitary, and thymus glands are calcium consumers. The repro-

ductive glands are calcium excretors (Bell). The thyroid is difficult to place: possibly it has several secretions acting in different ways (Biedl).

The ductless glands act as eliminators of toxins, and any acute illness will throw a strain upon them. For a time they become hyperplastic and over-secrete, and then follows a period of reaction and lessened activity with insufficiency of secretion, the result being, especially in childhood when reproductive glands are inactive, great increased excretion of calcium, and consequently lessened floating calcium in the body. The saliva will suffer together with other tissues, and becomes less alkaline. The parotid saliva, always the least alkaline in health (Schafer) may even become acid, therefore less able to neutralize acids formed by fermentation in the mouth, and consequently caries results.

There is an intimate relation between the suprarenal medulla—which produces the adrenin—and the sympathetic nervous system, by way of the cromaffin tissue which is peculiar to both. The injection of adrenin acts on the saliva glands in the same way as stimulation of the sympathetic, *i.e.* it produces a saliva rich in salts. Consequently suprarenal inactivity would give a saliva poor in lime salts.

Utilization of Lime Salts.

(*a*) *Childhood.* For growth, the thymus holding the reproductive organs at bay until growth is complete.

(*b*) *Pregnancy and lactation.* For growth of fetus and formation of milk. The ovaries here are also inactive, and calcium utilizers have it all their own way.

In both these cases the calcium equilibrium may be very easily upset, and a certain amount of starvation result. Both are periods of excessive caries.

(*c*) *Middle life.* Calcium equilibrium most stable.

(*d*) *Old age.* Excess of calcium stored in tissues, *e.g.* bloodvessels, joints, etc. The reproductive glands are not so efficient and normal calcium elimination is deficient. There is practically no caries—hard sclerotic teeth of gout.

Dr. Broderick found that the saliva of patients suffering from acute infectious disease is deficient in alkalinity—most markedly so in measles—that the calcium content was considerably less, and that both the alkalinity and the calcium content could be considerably raised by administering a polygland substance of suprarenal, pituitary, and thyroid.

The action of the thyroid is somewhat difficult to understand, as clinically thyroid feeding increases the calcium excreted in the urine, and also patients with arterio-sclerosis do very well on thyroid. On the other hand, in certain cases it would seem to act as a utilizer of calcium, *e.g.* ununited fractures heal with great rapidity under thyroid medication. Chilblains disappear rapidly when treated with calcium and thyroid, the action probably being that it enables the body to utilize fixed calcium temporarily for repair purposes. It also helps to regulate the action of the sympathetic nervous system (note its action on nocturnal incontinence in children). For this reason the author added it to his polygland.

Conclusions are that the predisposing cause of dental caries is a diminution of the calcium-utilizing power of the body, due to a want of balance in the secretions of all the ductless glands, brought about by any pathological condition causing an extra strain to be thrown upon them. Acute infectious fevers in childhood would be the most important, but pregnancy in women, with an unstable calcium equilibrium and any illness or run-down condition, may be responsible.

If this is so, dental caries is a preventable disease, and the treatment—to bring the calcium back to the normal—is in the hands of the medical profession, either by a polygland substance similar to the one Broderick used or possibly by calcium salts alone if the patient can utilize them. The results should be beneficial not to the teeth alone, but should shorten convalescence considerably by reason of the help and stimulation of the defective toxin-eliminators.

Section III.—*Dental Surgery and Therapeutics.*

TUBULAR RUBBER-DAM HOLDER, FOR TREATING AND DRYING ROOTS.

By M. P. Borkowski, Dental Surgeon, Chief of Dental Service in the Municipal Dispensary of Courbevoie, France.

In this paper is presented a metal rubber-dam holder for roots, consisting of a hollow tube of about 4 mm. length, ending at its

upper portion in a sort of tent. On the outside the end is fitted with small spurs which hold the tube upon the inner walls of the root-canal, thus keeping out all saliva. The inside of the tube is smooth to permit of the easy introduction of probes and antiseptics. This tubular rubber-dam holder serves the purpose of keeping roots dry for their utilization as bridge abutments or for pivot crowns. It is constructed so that the dam can be put upon several roots.

TREATMENT OF THE GUMS. By Dr. Kayserling, Berlin.

Neglected gums of bluish red appearance and covered with a viscous mass are often due to various forms of tartar. The inflamed gingiva is reddened, sensitive to pressure, and swollen, and bleeds upon the slightest touch. The gingival papilla is so loose that pathogenetic agents enter the alveoli. In some cases inflammation of the gums is due to mechanical irritants such as fish-bones, toothbrush bristles, etc., or to stimuli due to metabolic diseases, such as gout, diabetes, and influenza. For treatment, the following methods are available: (1) Mechanical removal of the tartar; (2) chemical dissolution of the tartar with tartasol, injection of lactic acid or tincture of iodin into the gingival papilla; (3) electric massage of the gingivæ for five minutes by means of a vibratory apparatus, or use of the high-frequency current.

Section IV.—*Dental Physics, Chemistry, Radiography, and Metallurgy.*

CHEMICO-PHYSICAL PROPERTIES OF DENTAL CEMENTS. By Dr. Abraham, Berlin.

The writer urges the co-operation of specialists for creating a scientific basis for the study of the properties of silicate cements.

The materials which are used in the plastic state, and which solidify to the hardness of stone within a shorter or longer time, are divided into the following three groups: (1) Materials which solidify by giving off water. (2) Materials which solidify by taking up water. (3) Materials which solidify by a chemical combination of base and acid, viz, by forming a salt.

Clay belongs to the first, gypsum to the second, chalk to the third group.

In comparing silicate cements with Portland cement, the writer points out certain similarities, also considerable differences, between these two materials. Portland cement is listed in the second, silicate cement in the third group. Besides the chemical qualities, certain still obscure physical phenomena are critically discussed. Owing to its great transparency, translucin has been used for making microscopic studies and photomicrographs, which show that, in solidifying, translucin assumes a micro-crystallinic structure in which rod-shaped crystals form minute hollow spaces. This explains the phenomenon that silicate cements in a moist state appear transparent, in a dry state opaque, the transparency being due to moisture entering the microscopically minute hollow spaces, thereby producing uniform light-refraction.

Section V.—*Dental Prosthesis.*

DESIGN AND RETENTION OF PARTIAL DENTURES. By Arthur L. Bostock, L.D.S., Kidderminster.

The writer discusses the essentials in the restoration of missing teeth, and emphasizes certain factors, the practical application of which constitutes the difficulties to be overcome in the technique of their construction, namely, (1) prophylactic or hygienic, (2) functional, and (3) cosmetic or esthetic considerations. Great attention is required that the expense be kept within the means of all classes of people. In the construction of partial dentures, the avoidance of irregular spaces, a minimum contact with natural teeth, and a minimum covering of the oral tissues are to be striven for. Mastication and speech must be duly considered in the technical construction of the denture, and the strength requisite for its withstanding the stress of correct occlusion must be provided for. The natural appearance of the mouth, together with immobility of the denture, must be considered. The means of secure retention by the use of clasps and adhesion by close contact, as well as the factors influencing the selection of retentive means, are discussed.

Section VI.—*Orthodontics.*

PARTIAL ROTATION OF MOLARS IN ORTHODONTIA. By Professor Francis Jean, Paris.

Bicuspids and molars which have rotated upon their long axis produce trouble in the occlusion of the dental arches, hence facial deformities. No matter what the cause of the

anomaly, the tooth or teeth are to be rotated back to normal position, in order to insure perfect regularity of the dental arches. This is achieved by fitting the rotated teeth with metal bands bearing tubes, the direction of which must be carefully studied and maintained in order that a metal arch, by its rigidity and constant action, may carry the teeth to the desired position.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

RESULTS OF MODERN THERAPEUTICS BY DENTO-SURGICAL DRESSINGS AND PROSTHESIS. By Zahnarzt Nauenburg, First Assistant at the Dental Institute of the University of Leipzig.

The writer remarks that but a very few dental schools offer a course in dento-surgical dressings and prosthesis, which accounts for the fact that most dentists do not concern themselves with this branch, and leave the patients, not always to their advantage, to the surgeon's therapeutic measures. In hospitals, where dental departments are being inaugurated more and more, splendid opportunities for meritorious work are offered to the dentist.

By means of case reports and lantern slides collected at the polyclinic of the university, the municipal hospital, and the surgical clinic of Leipzig, the writer demonstrates the success of modern therapeutics, and proves the great adjuvant value of prosthetic art to the surgeon and the advantages for the patients. The cases comprised typical serious lesions in the nature of fractured and dislocated jaws and resections.

CASE OF ABSCESS IN THE NECK, OF DENTAL ORIGIN, CURED BY ANTI-STAPHYLOCOCCIC VACCINE. By Dr. B. Landete, Madrid.

The case described was that of a man of thirty, of feeble constitution, and presenting an abscess in the left side of the neck arising from periodontitis in connection with a molar. After eight or ten days of fruitless treatment by warm antiseptic baths, extraction of the tooth, and disinfection of the wound and the mouth, treatment by vaccine was proposed, which gave very good results.

Four injections were applied in intervals of five days, the first injection being one-half cc., and the last one 2 cc.

The patient felt after the first injection a decided local and general reaction, developing fever within twenty-four hours. At the second injection he only suffered a very slight febrile attack six hours after application; during the following injections, and notwithstanding the increased proportions, the patient was not in the least disturbed. Improvement followed immediately after the second injection.

The writer is convinced that vaccines will afford excellent results in such cases.

Section VIII.—*Anesthesia (General and Local).*

SEROCAIN, A POWERFUL ANESTHETIC SERUM, FOR LOCAL AND REGIONAL ANESTHESIA IN DENTISTRY. By V.-E. Miègeville, Dental Surgeon, D.E.D.P. and D.F.M.P., Pharmaco-Chemist First Class, Instructor in Special Therapeutics in the École Dentaire de Paris.

Serocain is a stabilized and sterilized isotonic solution of 2 per cent. novocain in physiologic serum. It produces an immediate anesthesia of great depth, and of from one to two hours' duration. Its toxicity is six or seven times less than that of cocain, hence practically negligible, since from 4 to 6 cc. can be injected without risk. It produces neither nausea, vertigo, syncope, nor malaise. The needle puncture is hardly felt. Slow infiltration even of inflamed tissues is absolutely painless. Cicatrization occurs very rapidly, without leaving any eschar if the precaution of thoroughly cleansing the gingivæ before making the injection is taken. The writer discusses the indications and operative technique of serocain, and his observations.

Section IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

DENTAL INSPECTION AND TREATMENT IN LONDON COUNTY COUNCIL SCHOOL. By C. Edward Wallis, M.R.C.S., L.R.C.P., L.D.S. (Dental Surgeon and Lecturer to King's College Hospital, formerly Dental Surgeon to the Victoria Hospital for Children, Chelsea).

Dental treatment for elementary school children in London is provided for by means

of some twenty suitably located Dental Treatment Centers; several of these dental centers form part of general School Treatment Centers, in which eye, ear, throat, and minor ailments are dealt with as required.

The centers, though subsidized by the L.C.C., are actually provided and managed by local committees of hospitals, dispensaries, medical men, etc.

The premises have to be approved by the L.C.C. and the board of education, and the dental treatment is under the supervision of the Public Health department of the L.C.C.

Dental inspection is carried out in the schools by specially appointed dental inspectors, "in order to provide a sufficient number of children for the work of the centers"; these inspections are held weekly or fortnightly, as required, and each inspection session is followed by an address to the assembled parents on the care of their children's teeth.

The dental treatment centers are worked as part of an organized scheme for the dental treatment of the school children of London, in which preventive and curative treatment go *pari passu*.

The dentists engaged in inspection and treatment are part-time officers, as also are the anesthetists, who attend at regular intervals; trained nurses are also provided by the L.C.C.

The general principle of treatment involved is the greatest good of the greatest number, and consists in rendering each child's mouth functional and free for each session.

Ten more dental centers are to be provided this year, which will make a total of thirty located as found necessary.

SECTION X.—*Dental Education.*

METHODS OF MANUAL TRAINING AS TAUGHT IN THE UNIVERSITY SCHOOL OF DENTAL SURGERY, MONTREAL, CANADA. By EUDORE DUBEAU, L.D.S., D.D.S.

The writer enumerates the items of the four years' course, offered in the University School of Dental Surgery of Montreal, as follows:

First year. Freehand drawing; anatomical drawing; tooth sections; clay modeling; carving; prosthetic technique.

Second year. Freehand drawing; clay modeling; operative technique; prosthetic technique; crown and bridge technique.

Third year. Freehand drawing; operative technique; crown and bridge technique; prosthetic technique.

Fourth year. Freehand drawing; color study; operative technique; crown and bridge technique; prosthetic technique.

The descriptive work of each year is discussed by the aid of drawings and models, showing the advanced stage in each.

PERISCOPE.

Securing Rubber-dam Clamp on Conically Shaped Teeth.—Sandarac varnish applied to a conical tooth will prevent the clamp from slipping.—J. A. MCCLAIN, *Oral Health.*

Carbolic Acid for Sterilizing or Obtunding Dentin.—When carbolic acid is used for sterilizing or obtunding dentin, alcohol should not be used to dry out the cavity. Alcohol and carbolic acid are incompatible, and the action of the latter is neutralized in such cases. Chloroform should be used in place of alcohol.—F. W. P., *Journ. Allied Dental Societies.*

Pain Following Extraction.—When the margins of the wound left after extraction unite very early, the discharges which naturally come away from the granulating surface at the base of the socket have no exit; the consequence is that they are retained, and set up a local traumatic inflammation, which leads to swelling of the surrounding tissue. Such freshly healed surfaces prematurely covering the orifice of sockets must be separated, the sockets syringed out, and a small piece of lint inserted and allowed to remain for about twelve hours. An antiseptic mouthwash should also be prescribed.—J. F. COLYER, *Ash's Monthly.*

Mouth-wash to be Employed in Scarlet Fever.—For purposes of oral antisepsis in scarlatina, the following mouth-wash is recommended: Phenyl salicylate 2 gram; boric acid 10 gram; alcohol 40 gram; aqua 500 gram.—Sevestre, *Nouveaux Remèdes*, per *N. Y. Med. Journal.*

Facilitating Removal of Wax Pattern for Gold Inlay from Cavity.—For facilitating the removal of a wax pattern for a compound gold inlay from a cavity, a staple of fine gold wire, both ends of which have been thickened to form tiny buttons, is heated and pressed into the wax pattern. When the pattern is finished, it can be withdrawn by grasping the protruding arch by means of pliers.—Sachs, *Oesterreichische Zeitschrift für Stomatologie.*

Statistics Concerning Number of Root-canals in Molars.—According to J. Lacroix, the upper first molar has three root-canals in 54 per cent., four root-canals in 46 per cent. of cases; the upper second molar three root-canals in 78 per cent., four canals in 12 per cent. of cases. The lower first molar has three canals in 75 per cent., four canals in 15 per cent. of cases; the lower second molar three canals in 62 per cent., two canals in 28 per cent., four canals in 5 per cent. of cases.—J. Filderman, *Journ. Odontologique de France.*

Importance of Correcting Malocclusion During the Period of Tooth Eruption.—Nasal stenosis usually produces contracted arches of deciduous teeth. The remedying of nasal stenosis, however, will not cure mouth-breathing if the deciduous arches are contracted. The rhinologist and orthodontist must co-operate in giving relief from nasal stenosis complicated by contracted arches. Expansion of contracted deciduous arches will help to prevent the permanent teeth from erupting abnormally. The malocclusion of the teeth should be corrected during the period of tooth eruption. The prognosis of orthodontic treatment during the developmental stage is favorable. The postponing of orthodontic treatment until after the permanent teeth have erupted may then be irremediable.—M. N. Federspiel, *Internat. Journ. Orthodontia.*

Splints for Fracture of Lower Jaw.—H. Schroeder gives illustrations of the aluminum splints for the lower jaw, of which he keeps a supply on hand at the front, also stout wire splints held in place by being tied to the teeth. But the greatest reliance is placed on hard rubber shells corresponding to the soft parts over the entire jaw. The fractured jaw is exposed, and all devitalized tissue cut away; then a corresponding piece of one of the rubber shells is cut out to fit the gap in the jaw, and wired to the bone on the inside. He has frequently had the wounds heal by primary intention after treatment of this kind, even when half the jaw had been shot away. The patient can open and shut the mouth almost at once. A permanent prosthesis can be substituted for the temporary device as soon as healing is complete, namely in four or six weeks.—*Medizinische Klinik*, per *Journ. Amer. Med. Association.*

Nitrous Oxid Anesthesia and Analgesia with Oxygen and Air Admixture.—Nitrous oxid analgesia and anesthesia differ from each other in degree only, the one being a continuation of the other, and we may obtain any necessary degree of anesthesia to meet a corresponding degree of pain. The sensations incident to analgesia should be utilized in strengthening mental suggestion in those cases not easily controlled. Asphyxia, the only danger in nitrous oxid anesthesia or analgesia, may be eliminated absolutely in the latter by administering at least eighteen to twenty per cent. of oxygen with the gas. A portion of this oxygen must come from a pure supply. Air as a source of oxygen supply is insufficient to eliminate asphyxia in all cases; oxygen used alone is expensive, but a combination of air and oxygen makes the ideal diluting mixture for nitrous oxid analgesia. Accurate rebreathing is a means of regulating the ventilation, stimulating it when insufficient for adequate absorption of gases in the lungs, and reducing the fresh gas consumption when the patient would overventilate if left alone. Incidentally, it saves gas and reduces the cost.—E. I. McKesson, *Dental Summary.*

Dermatitis Due to Plaster of Paris.—Dermatitis or artificial eczema, of the thumb and fingers chiefly, was observed in a dental surgeon, the attacks being always consecutive to contact with plaster of Paris. The disorder was similar to that observed in workers in cement. The skin was only moderately reddened; there was a considerable breaking up of the horny layer with a tendency to form fissures where the skin was folded into creases; a few attempts at vesicle formation were seen, but the eczema did not assume the frankly vesicular type seen in the more acute chemical poisonings of the skin such as are produced by biniodid of mercury. Plaster of Paris is a strong dehydrating agent and a

mechanical irritant as well. That it possesses some irritating quality of a chemical rather than a mechanical nature may be concluded from the fact that waters the hardness of which is chiefly due to calcium sulfate are very prone to set up disturbances of the epidermic surface. The disease was easily cured by removing the cause and dressing the hands with suitable applications. Trouble of this nature may be avoided by wearing rubber gloves when manipulating plaster of Paris.—A. WHITFIELD, *Brit. Journ. Dental Science.*

Associated Movement of the Jaw and Upper Lid.—The case reported occurred in a baby girl, six months of age when first seen. The movements were first noticed when she was about a month old. The right eyelid went up and down as the baby sucked at the breast. The child was fat and healthy looking, but there was a slight ptosis (prolapsus) of the right upper eyelid, the lid falling as low as the level of the upper edge of the pupil. As far as one can tell in so young a baby, voluntary movement of the levator was good, and also of the other ocular muscles. The pupils were equal and reacted to light; there was no facial asymmetry, and no difference in size of the tarsal plates. As the baby sucked, the right lid was raised synchronously with the movements of the jaw, so that a little sclerotic was shown each time above the right cornea. As the jaw was moved away from the side of the lesion, as in grinding the teeth, the lid was raised. An almost imperceptible lateral movement was sufficient. The left lid was not moved; the right eye itself remained stationary. Slight sucking movements produced no movement of the lid. When the baby yawned or laughed, the lid was retracted to an extreme degree, and showed a large extent of sclerotic. The movements are diminishing in frequency and in extent. There is no history of a similar condition or of ptosis in the family.—*Brit. Journ. of Children's Diseases*, per *Journ. Amer. Med. Association.*

Pre-Columbian Decoration of the Teeth in Ecuador.—Among the natives of parts of South America before the advent of the Spaniards it was the custom to decorate the teeth by having gold and precious stones inserted in them.

Dr. Marshall H. Saville, professor of American archaeology at Columbia University, in his explorations in Central and South America, discovered several skulls the teeth of which were so decorated. In the Mayan area he found teeth inlaid with jadite. In Mexico he found teeth with hematite, turquoise, rock crystal, and obsidian settings.

At Atacames, in the province of Esmeraldas, Ecuador, he obtained an upper jaw containing two extraordinary teeth. The middle incisors each bore a disk of gold that had been inserted in a cavity drilled in the enamel as perfectly as a modern dentist could have done it. But the right central is not a central incisor at all, but a right lateral incisor that had been taken from someone else's mouth and implanted to replace a missing front tooth. It fits perfectly in the socket, though it is not as long as that cavity, and Professor Saville considers this to be proof that it was implanted in the jaw only a short time before death. At Copan he discovered a lower jaw with an artificial tooth carved out of some dark stone.

The most interesting of these specimens is a skull discovered at La Piedra, Ecuador, by Mr. Pinzon and George D. Hedian, American consular agent at Esmeraldas, and presented to Professor Saville by them. It is that of a woman. The incisors and canine teeth are almost entirely covered on their outer face by a super-layer of gold. A broad band of enamel has been filed off, leaving enamel only at the cutting edge and close to the gum. In some instances the sawing has been done slightly under the enamel, so that the gold might be held securely. The gold has gone from all the teeth except the left lateral incisor. In some of the others traces of cement may still be seen.

In describing these extraordinary teeth in the *American Anthropologist*, July to September 1913, Professor Saville asks how the owners could have stood the pain of the slow cutting by stone drills with sand and water, for no metal tools with which the work could have been done have been discovered in Ecuador. He suggests that these natives had found out the property of coca in producing local anesthesia. The people of the coast were addicted to chewing coca leaves mixed with lime, and Professor Saville thinks it reasonable to surmise that they may have used it to deaden the pain of the filing and sawing.

The gold and jeweled inlays are as skillfully done as those of a dentist of today; there is no sign of decay either behind or around them, which proves with what perfect accuracy they must have been made.—*Nebraska Dental Journal.*

DENTAL LEGISLATION.

DENTAL LAW OF PENNSYLVANIA

AS AMENDED

1915.

AN ACT

REGULATING AND DEFINING THE POWERS AND DUTIES OF THE DENTAL COUNCIL AND THE STATE BOARD OF DENTAL EXAMINERS; PROVIDING FOR APPOINTMENT OF EXAMINERS; DEFINING QUALIFICATIONS OF APPLICANTS FOR EXAMINATION; CONDITION OF GRANTING LICENSES, REGULATING AND LIMITING THE PRACTICE OF DENTISTRY; PROHIBITING PRACTICE BY, OR EMPLOYMENT OF, UNLICENSED PERSONS, AND PROVIDING PUNISHMENT THEREFOR AND DISPOSITION OF FEES AND FINES, AND FIXING THE APPROPRIATION TO THE DENTAL COUNCIL.

SECTION 1. *Be it enacted, etc.*, That the Dental Council of Pennsylvania shall consist of the Secretary of Internal Affairs, the Commissioner of Health, the Superintendent of Public Instruction, the President of the Pennsylvania State Dental Society, and the Secretary of the Board of Dental Examiners.

The Dental Council may make and adopt for its government all necessary rules, regulations, and by-laws, and shall locate and maintain an office within this state for the transaction of its business. Three members of the Dental Council, one of whom shall be the president of the Pennsylvania State Dental Society, or the secretary of the Board of Dental Examiners, shall constitute a quorum for the transaction of business. In case of the absence of the president of the Pennsylvania State Dental Society, he may nominate one of the vice-presidents of that society as his proxy, with full power to act in his place.

The Dental Council shall elect a president, secretary, and treasurer, whose terms of office shall be for one year, or until their successors shall be elected. The president shall be elected only from the members of the Dental Council.

The Dental Council shall supervise and provide rules, in conformity with the provisions of this act, for the examination of all applicants for license to practice dentistry in this commonwealth, and shall keep records of their transactions; and a registry of all licenses granted by them, stating the name, age, residence, and qualifications of the person licensed to practice dentistry, and whether qualified by examination, or otherwise; said registry shall be a public record and accessible as such, and shall be kept at the place provided for the purpose at the Capitol in Harrisburg.

The Dental Council shall receive annually the sum of two thousand dollars, to be paid by the State Treasurer on the warrant of the Auditor-general, from which the Dental Council shall pay the salary of its secretary, stenographer, and clerks, postage, and all its other expenses, including milage, and ten dollars to each member for each day's attendance at regular meetings of the Dental Council.

SEC. 2. The Dental Council shall have power to grant licenses to practice dentistry in this commonwealth, to any person who may be duly qualified under the provisions of this act.

Any person may present to the Dental Council a written application for a license to practice dentistry, together with a fee of twenty-five dollars, and with proof that he or she is not less than twenty-one years of age, is of good moral character, and has obtained a competent education, together with a diploma conferring upon him or her the degree of Doctor of Dental Surgery, or other established dental degree, from a reputable educational institution maintaining a three years' course in dentistry; thereupon the Dental Council may authorize the examination of such person by the State Board of Dental Examiners.

Upon receiving from the Board of Dental Examiners a report of the examination for license of any applicant who shall have been returned as having successfully passed said examination, the Dental Council shall issue to the applicant a license to practice dentistry in the State of Pennsylvania. Every

license to practice dentistry, issued pursuant to this act, shall be subscribed by the officers of the Dental Council and by each Dental Examiner who reported the applicant as having successfully passed an examination such as is provided by this act, and said license shall be sealed with the seal of the Dental Council of the Commonwealth of Pennsylvania, and shall be recorded in a book to be kept in the office of the Dental Council, and the number of the book and page therein containing said record shall be noted upon said license.

Upon the recommendation of the Board of Dental Examiners, the Dental Council may also issue a license, upon the payment of a fee of twenty-five dollars, to any person who is of good moral character, and who shall furnish proof that he or she has a license to practice dentistry granted by the Dental Council, or other lawfully constituted authority, of any other state or country where the preliminary and professional education required by law is equal to that provided by the laws of this commonwealth.

The Dental Council may also license any applicant who has been in the actual, lawful practice of dentistry for not less than ten years upon the report of the Board of Dental Examiners that, after due investigation or examination, it finds his or her education and professional attainments and experience to be, together, fully equal to the requirements for license in this commonwealth.

The Board of Dental Examiners shall keep a book of registration at the office of the board, in which shall be registered the names and addresses of each person duly qualified under existing laws or who may hereafter become qualified to conduct the practice of dentistry in Pennsylvania.

And it shall be the duty of all persons now qualified and engaged in the practice of dentistry, or who shall hereafter be licensed by the Dental Council to engage in such practice in this commonwealth, to be registered with the said Board of Dental Examiners as practitioners on or before the first day of January, one thousand nine hundred and sixteen, and thereafter to register with said Board of Dental Examiners in like manner annually on or before the first day of January of each succeeding year. The form and method of such registration shall be provided for by such Board of Dental Examiners in such manner as will enable the said board to carry into effect the purposes of this act.

And the said Board of Dental Examiners shall be entitled to demand for each annual registration, and for the certificate hereinafter provided for, a fee not to exceed one dollar, which sum shall accompany the application for such registration.

Upon receiving a proper application for such registration, accompanied by the fee above provided, the said Board of Dental Examiners shall issue its certificate of registration to the applicant for registration, upon which shall be noted the number of the book and the page therein containing the record of such registration. Said certificate, together with its renewals, shall be good and sufficient evidence of registration under the provisions of this act.

Any person who shall practice dentistry without having been registered in accordance with the provisions of this act shall be guilty of a misdemeanor, and on conviction thereof in the court of quarter sessions, in the county where the offense shall have been committed, shall pay a fine of not less than ten dollars and not more than one hundred dollars.

Every license issued otherwise than as a result of a written examination, shall state the grounds upon which it is granted.

All fees collected by the Dental Council shall be disbursed by the Dental Council in payment of the expenses of the Board of Dental Examiners: *Provided*, That any surplus, unexpended at the end of any fiscal year, shall be apportioned among the Dental Examiners, in the proportion of the number of applicants for license respectively examined by each during said fiscal year.

All fees for registration by this act shall be payable to the Board of Dental Examiners, and the same shall be disbursed by the said board in payment of the expenses of registration: *Provided*, That any surplus unexpended at the end of any fiscal year shall be used for the enforcement of the provisions of this act.

Sec. 3. The Board of Dental Examiners of the Commonwealth of Pennsylvania shall consist of six persons, whose term of office shall be for three years, from the first day of September of the year in which they may be appointed.

The Pennsylvania State Dental Society shall have power to nominate from its membership at least double the number of candidates required to fill the vacancies occurring annually in the office of Dental Examiner. Said candidates shall have been engaged in the actual practice of dentistry in this commonwealth during a period of not less than ten years. The Governor of this commonwealth shall have power to appoint dental examiners to fill all vacancies, occurring from any cause, only from the candidates nominated as aforesaid. No member of the faculty of a dental college shall be eligible to ap-

pointment as a member of the State Board of Dental Examiners. In the event of failure of the Pennsylvania State Dental Society to nominate candidates, as aforesaid, the Governor shall appoint members in good standing of the said society, without other restrictions. The Governor shall have power to remove any examiner for continued neglect of duty, incompetency, or dishonorable conduct.

The Board of Dental Examiners may make all necessary rules, regulations, and by-laws concerning the transaction of its business, subject to the approval of the Dental Council; and shall have power to require attendance of persons and papers, and take testimony concerning all matters within its jurisdiction, and the presiding officer of said board, or of any committee thereof, shall have power to issue subpœnas and administer oaths.

Sec. 4. For the purpose of examining applicants for license, the State Board of Dental Examiners shall hold two stated meetings each and every year; to wit, one in June, and one in December. The June meetings shall be held simultaneously in Philadelphia and Pittsburgh. The December meetings shall be held simultaneously in Philadelphia and Pittsburgh, or, in the discretion of the board, may be held in Harrisburg.

Special meetings may be held, the time and place to be fixed by said board. Due notice of all meetings shall be given. At stated and special meetings a majority of the board shall constitute a quorum thereof; but the examinations may be conducted by a committee of one or more of the examiners, duly authorized by the said board.

All candidates for examination for license to practice dentistry in the State of Pennsylvania shall be required to pass an examination, by the State Board of Dental Examiners, upon the following subjects: First, general anatomy and physiology; second, special dental anatomy; third, dental histology; fourth, dental pathology; fifth, chemistry and metallurgy; sixth, materia medica; seventh, dental pathology, bacteriology, and therapeutics; eighth, anesthesia; ninth, oral surgery; tenth, principles and practice of operative and prosthetic dentistry.

Said examination shall be conducted in writing, and shall embrace all the subjects named in this act. Each applicant shall also furnish to the Board of Dental Examiners satisfactory evidence of his or her proficiency in the manipulative procedures of dentistry, either by producing an example of his or her work, with proof of the execution of the same, or by a practical demonstration of his or her skill in the presence of the examiner. After each stated examination an official report, signed by the president and secretary and each acting member of the said Board of Dental Examiners, stating the examination average of each candidate in each branch, the general average, and the results of the examination, whether successful or unsuccessful, shall be transmitted to the Dental Council. The said report shall embrace all the examination papers, questions, and answers thereto. All such examination papers shall be filed by the Dental Council at Harrisburg, and kept for reference and inspection for a period of not less than five years.

Sec. 5. It shall be the duty of every person practicing dentistry within this commonwealth to display, or cause to be displayed, his or her name, in a conspicuous place at or near the entrance to the office or place where he or she is practicing dentistry; and to keep his or her license and certificate of registration displayed in a conspicuous place where he or she practices, in such manner as to be easily seen and read. Any person practicing dentistry within this commonwealth, within six months from the passage of this act, shall cause his or her license to be registered in the office of the prothonotary of the court of common pleas of the county in which such person shall practice dentistry, unless the same has already been registered in said county. Any person who shall neglect to cause his or her license to be registered, as herein provided, shall be construed to be practicing dentistry without a license: *provided*, This act shall not affect the right of any person to practice dentistry who is entitled to do so under the provisions of an act of Assembly in force, or who shall have conducted the actual lawful practice of dentistry in this commonwealth for five years continuously preceding the passage of this act.

Sec. 6. It shall be unlawful for any person to employ any person as an operator in dental surgery, or practitioner in dentistry, or to cause or permit any person to act as an operator in dental surgery, or as a practitioner in dentistry, who is not duly qualified and registered as a practitioner in dentistry, as provided by law. A person shall be deemed to be engaged in the practice of dentistry within the meaning of this act who shall treat diseases or lesions of the human teeth or jaws, or perform operations of any kind thereon, or insert any artificial teeth, fixtures, or appliances for the restoration, regulation, or improvement of the dental organs, or who is manager, proprietor, or conductor of a place for performing dental operations, or who for

a fee, salary, or other reward, paid or to be paid to himself or another person, performs any of the before-named dental operations, or who uses the word dentist, dental surgeon, or other letters or titles in connection with his name, which in any way represent him as being engaged in the practice of dentistry. This act is not intended to prevent a *bona fide* student in regular attendance upon any dental college in this state from practicing dentistry under the direct supervision of one of his teachers in the regular infirmary of such college, or a legal practitioner of another state making a clinical demonstration before any incorporated dental society for the purpose of instruction and without remuneration. This act shall not prohibit physicians or surgeons in the regular practice of their profession from extracting teeth for the relief of pain or making applications for such purpose.

SEC. 7. It shall be unlawful for any person to circulate or advertise fraudulent or misleading statements as to the skill of the operator, the quality of the materials, drugs, or medicine used, or methods practiced.

SEC. 8. Any person who shall practice dentistry without being duly licensed, or who shall practice dentistry or induce any person to practice dentistry in violation of any of the provisions of this act, not hereinbefore provided for, shall be guilty of a misdemeanor, and upon conviction shall be punished by a fine of not less than fifty dollars nor more than five hundred dollars, or by imprisonment not exceeding six months, or both fine and imprisonment at the discretion of the court.

All fines received under this act from convictions resulting from information instituted at the instance of the Pennsylvania State Dental Society shall be paid to the said society.

After July first, one thousand nine hundred and twenty-one, the State Board of Dental Examiners shall require that candidates for license for the practice of dentistry, in the State of Pennsylvania, shall have been graduated from a dental school maintaining a course of study consisting of four annual sessions each, in separate academic years; and further: When this provision shall become operative, the State Board of Dental Examiners may examine prospective candidates for license to practice dentistry in the fundamental branches of the curriculum at the end of the second year of the four years' course.

SEC. 9. All acts and parts of acts inconsistent with the provisions of this act are hereby repealed.

Approved—May 3, 1915.

DENTAL COLLEGE COMMENCEMENTS.

UNIVERSITY OF SOUTHERN CALIFORNIA, COLLEGE OF DENTISTRY.

THE sixteenth annual commencement of the University of Southern California, College of Dentistry, was held in the Shrine Auditorium Building, June 10, 1915.

The commencement oration was delivered by Bishop Edwin H. Hughes, D.D., LL.D.

The degree of Doctor of Dental Surgery was conferred by George F. Bovard, D.D., LL.D., president of the university, upon the following graduates:

George Aloojian
Robert H. Andrews
Raymond F. Bell
Harry Block
Forest M. Branch
Harold C. Brimelow
Archie S. Brown
Hugh Brown
Vernette H. Brown
Frank R. Chisholm
Karn I. Chun
Lee A. Cobb
Walton B. Cobb
Horace G. Codling
Clarence W. Criger
Mack O. Dumas
David L. England
William R. Farmer
William L. Fisher
Gustave B. Fuessel
Junius Gibbons
Guy C. Gossard
Harold S. Gray
Chester L. Hammar
Ralph W. Hayward
George E. Hill
Lloyd E. Hodges
Floyd I. Kimbell
Jacob Kleinberg
Arthur W. Lufkin
Glenn C. Leisure
Charles A. MacDonald
Stanley L. McKellar
Fred L. Mitchell
Isao Okuyoshi
Raymond C. Peterson
Frank H. Petty
Paul S. Reese
Guy F. Rice
Haig M. Sarkisian
Louis C. Schildwachter
Henry M. Shaffer
Charles Snipes
Hans W. Sorensen
Ray Swartz
Ernest C. Underhill
Napp Young

THE THOMAS W. EVANS MUSEUM AND DENTAL INSTITUTE SCHOOL OF DENTISTRY UNIVERSITY OF PENNSYLVANIA.

The annual commencement exercises of The Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, were held on Wednesday, June 16, 1915, at the Metropolitan Opera House, Philadelphia, Pa.

An oration was delivered by Prof. Felix E. Schelling, Litt.D., LL.D.

The degree of Doctor of Dental Surgery was conferred by Edgar F. Smith, Ph.D., Sc.D., LL.D., provost, upon the following graduates:

Ricardo E. Abadia	Panama
Arthur S. Bailey	New Jersey
Aloysius L. Barry	New Jersey
Francis C. Bartleman	New Jersey
Charles V. Bates	New York
Robert F. Beatty	Pennsylvania
Gershon Berendt-Bennett	Australia
Horace D. Birchard	Pennsylvania
Leo R. Brady	New York
Paul Brady	New York
Frederick F. Bruch	Pennsylvania
Joseph A. Burgun	Pennsylvania
Conovar H. Burlew	New Jersey
Lionel J. Burston	Queensland, Aus.
Oliver P. Bush	Pennsylvania
Thomas M. Campion	Connecticut
Robert W. Carroll, Jr.	New York
Pierce A. Cassedy	New Jersey
Alfred W. Chandler	New Jersey
Wilson Y. Christian	New Jersey
Carl A. Christiani	Pennsylvania
Maurice Coën	France
Joseph M. Cohen	New Jersey
Carmelo J. Colón	Porto Rico
Eric A. Constantine	Jamaica, B. W. I.
Lloyd N. Cooper	Pennsylvania
Richard A. Cooper, Jr.	Australia
John B. Copes	Pennsylvania
Walter A. Crane	England
James W. Crozier	Pennsylvania
John H. Curry	New Jersey
Joseph O. Curtis	New Jersey
Ernest C. DaCosta	Jamaica, B. W. I.
Norman S. Darlington	Pennsylvania
Robert S. Davis	Connecticut
Fred DeKorn	New York
Frederick W. Dickson	New York
Frank A. Dimicco	New York
Richard A. Dooley	Georgia
Walter M. Dunlap	Virginia
Arthur W. Elworthy	Queensland, Aus.
Langhorne W. Fink	Pennsylvania
Roscoe C. Funk	New York
Ramón Garcia	Spain
Alexander Garrow	Scotland
Tewfic N. Garzouzi	Egypt
Richard C. Gilmore	Pennsylvania
Cyril C. Gittens	Trinidad, B. W. I.
Louis D. Gluckman	Delaware
Linwood G. Grace	Pennsylvania
Alfred F. Groebner	Minnesota
Samuel B. Groh	Pennsylvania
Daniel F. Gurnsey	Utah
Ezra H. Hait	New York
Gordon W. Hannah	New York
Herbert W. Harris	District of Columbia
Rudolph J. Hefti	New York
Frederick A. Heitmann	New York
Herbert J. Hellman	New York
Albert P. Hoeffer	New Jersey
Paul Z. Hoffman	Pennsylvania
George H. Holmes	Pennsylvania
Charles F. Hornung	New York
Percy Horridge	New Jersey
Dudley C. Hughes	Virginia
Percy C. Hulse	New Jersey
Chester F. Hummel	New York
Alton S. Johnson	New York
Howard R. Jones	Pennsylvania
William D. Jones	New York
Jacob E. Kadel	New York
Osof E. Kahan	Washington
Erstine L. Kelly	Missouri
Louis King	Connecticut
Manuel Kligerman, Jr.	Connecticut
Paul C. Knapp	New York
Petrus M. J. Kocken	Holland
Ralph F. Krueger	New York
Edward G. Lane	Victoria, Aus.
Vernon E. Lane	New York
Augusto Lavagnino	Guatemala, C. A.
Isadore M. Levine	Connecticut
Leon Levy	Pennsylvania
Isaac S. Littele	New York
John M. Long	Indiana
Claude A. L. Lyon	New Jersey
James B. McAllister	New York
Daniel D. McArthur	Utah
Francis M. McCormack	New York
William H. Maby	New York
John L. MacEntee	Connecticut
John C. Mackin	Pennsylvania
Walter T. Madden	New Jersey
William L. Magee	Pennsylvania
Thomas W. Magner	New Jersey
Herbert F. Malabre	Jamaica, B. W. I.
John Mann, Jr.	New York
Clarence P. Marbarger	Pennsylvania
Jerome B. Marshall	Pennsylvania
David N. Mason	New York
William D. Maxwell	New Jersey
George S. Maynard	New Jersey
Humberto H. Mencia	Salvador, C. A.
William Mennies	New Jersey
Frank W. Meyers	New York
Robert D. Miller	Pennsylvania
Joseph W. Mooney	Pennsylvania
William F. Moreau	Massachusetts
Clayton C. Morehouse	New York
John L. Morrison	New Jersey
Charles Moses	Pennsylvania
James J. Nelson, Jr.	Pennsylvania

Frank B. Netherland	District of Columbia
James R. O'Donnell	Massachusetts
Ralph A. Oneto, Jr.	Connecticut
Albert W. Parker	Florida
Harold J. Parker	New York
Robert M. Pavageau	Columbia, S. A.
Charles G. Pérez	Costa Rica, C. A.
Ernest R. Perry	Massachusetts
Ernest C. Phillips	Jamaica, B. W. I.
Charles J. Pierce	New York
Ramón Portuondo	Spain
Leroy A. Potter	New York
Kenneth C. Pruden	New Jersey
Silas S. Rennie	Pennsylvania
Edward G. Ross	New York
Victor M. Sarti	Guatemala, C. A.
Alfred M. Schultz	North Carolina
Harry A. Sinclair	New York
Alejandro Stadthagen	Nicaragua, C. A.
Jacobus J. Stander	Orange F. S., S. A.
Harold J. Stokes	New Jersey
William P. Street	Massachusetts
Harvey A. Stryker	New Jersey
Creston Sutch	Pennsylvania
John J. Sweeney	New York
David B. Thickstun	New Jersey
Thomas H. Travilla	Pennsylvania
Fred S. Van Woert	New York
William E. Walton	Pennsylvania
David B. Warren	New Jersey
Max Wassman, Jr.	California
Keitoku Watanabe	Japan
Leon J. Weinberg	Pennsylvania
Joseph Weiss	New York
Marvin V. Welcher	New York
Eugene S. West	Pennsylvania
James D. White	New York
Floyd T. Wilcox	New York
Fred W. Wilcox	New York
Everest J. Wilson	Vermont
Everett L. Wilson	New York
Samuel S. Wisney	New Jersey
James F. Woodbury	Maine
Trevor Wright	Pennsylvania

Degree conferred (as of class of 1914) at University Council, February 12, 1915:

Edwin I. Harrington John R. Hayes E. P. A. Lopez

UNIVERSITY OF IOWA, COLLEGE OF DENTISTRY.

THE thirty-third annual commencement exercises of the University of Iowa, College of Dentistry, were held in Iowa City, Iowa, on June 16, 1915.

An address was delivered by John Barrett, LL.D.

The degree of Doctor of Dental Surgery was conferred by the president on the following graduates:

Rafidin Ahmed	India
Lester J. Allison	Iowa
Delos A. Bardellini	California
Vladimir V. Bele	Minnesota
Frank B. Benesh	Iowa
Melvin A. Billings	Iowa
R. Lloyd Borland	Iowa
Max E. Brown	Iowa
Milnor W. Case	Iowa
Harold O. Cobb	Iowa
Clarence J. Coder	Minnesota
Harry E. Cunningham	Iowa
Edward A. Dratz	Iowa
George C. Drinkwater	Iowa
Roscoe D. Feldman	Iowa
William H. Fields	Iowa
Leland T. Fillenwarth	Iowa
Archie R. Fisher	Iowa
James M. Fredericksen	Iowa
Paul L. Garzee	Iowa
Paul H. Giblin	Iowa
Herbert J. Guenther	Iowa
Elmer W. Hastings	Iowa
Mort Henkin	South Dakota
Edgar J. Hines	Iowa
Jessie P. Hoar	Iowa
Fred W. Hoffman	Iowa
Frank J. Hospers	Iowa
Louis M. Jacobson	Iowa
Walton R. Kinzer	Iowa
Glenn H. McCreight	Iowa
James L. McKone	Iowa
Alvin M. Mauer	Iowa
Shirley L. May	South Dakota
A. Glenn Miller	Illinois
Erskine O. Miller	South Dakota
Rudy E. Minger	Iowa
Rollo H. Moore	North Dakota
Robert C. Norman	Iowa
Lloyd A. Osborne	Iowa
Michael J. Plese	Hungary
Roy W. Remer	Iowa
George M. Schneider	Iowa
Gerald E. Seydel	Iowa
Harry C. Shrader	Iowa
Donald E. Smith	South Dakota
Mark C. Smith	Iowa
Jesse LeR. Somers	Iowa
Arndt Syverud	South Dakota
Erling Thoen	Iowa
Wallace Everett Voreck	Iowa
Lyman F. Wagoner	Washington
George H. Wandel	Minnesota
John G. Welch	Iowa
Benjamin Wenig	Iowa
Frederick A. Whitaker	Canada

GEORGE WASHINGTON UNIVERSITY, DENTAL SCHOOL.

THE annual commencement exercises of George Washington University Dental School were held in Washington, D. C., in Memorial Continental Hall, on June 9, 1915.

Addresses were delivered by Henry St. G. Tucker, LL.D., and by President Stockton.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Delmer D. Brower	Virginia
Josiah L. Carr	Texas
John A. Flood	New Jersey
Joseph A. Friedman	District of Columbia
Raymond O. Higgins	Nebraska
Golda Minkin	Russia
Joseph R. Palkin	Connecticut
Carl H. Schmidt	Massachusetts
Edward M. Slack	District of Columbia
Richard K. Thompson	District of Columbia
Edwin R. Tilley	District of Columbia
Lawrence R. Wagner	New York
Douglas A. White	Massachusetts

BALTIMORE COLLEGE OF DENTAL SURGERY.

THE annual commencement exercises of the Baltimore College of Dental Surgery were held in Baltimore, Md., on May 25, 1915.

An address was delivered by Chas. J. Bonaparte.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

W. J. Adlington	Canada
J. J. Amoss	Maryland
A. F. Arroyo	Porto Rico
H. E. Berry	Alabama
R. O. Bowles	West Virginia
C. Boylan	Canada
S. W. Breland	South Carolina
M. F. Broadwater	Maryland
R. J. Browne	New York
G. H. Burch	New York
W. L. Butler	Massachusetts
H. E. Byrnes	Connecticut
G. Caldwell	Maryland
C. C. Cannon	Alabama
F. M. Carroll	West Virginia
C. V. Chiques	Porto Rico
C. E. Colon	Porto Rico
L. F. Compton	West Virginia
F. P. Coogan	New York
F. R. Cordero	Porto Rico
V. DeConti	Rhode Island
E. V. Dillion	Virginia
R. P. Diaz	Porto Rico
J. F. Dobson	Connecticut
E. A. Doherty	Massachusetts
R. H. Dunnington	West Virginia
M. W. Dutton	Virginia
J. A. Elder	West Virginia
J. H. Engel	New York
T. K. Farrar	Canada
J. H. Ferguson	West Virginia
C. L. Fletcher	West Virginia
T. M. Gaffney	Massachusetts
C. F. Gillis	Canada
J. Grant	Massachusetts
J. F. Hall	Maryland
W. Huff	New Jersey
F. M. Ingram	South Carolina
C. L. Inman	North Carolina
J. J. Kersey	Connecticut
B. A. Keininger	Vermont
C. E. Killery	Vermont
E. L. Krapp	Connecticut
G. A. Lynch	New York
G. O. Lyon	West Virginia
J. A. Lyon	Venezuela
J. T. McReynolds	Texas
O. H. Mason	Virginia
S. M. Miller	Connecticut
E. S. Millett	Canada
D. J. Molloy	Connecticut
N. L. Morin	Rhode Island
V. D. Motto	Connecticut
J. E. Neff	Maryland
F. L. Nickerson	Massachusetts
A. Novack	Maryland
B. M. O'Brien	Canada
H. D. Orr	Maine
C. L. Page	West Virginia
J. J. Partridge	Massachusetts
S. E. Pickering	Maryland
J. R. Quinn	Massachusetts
E. E. Quintero	Porto Rico
L. J. Remy	Massachusetts
J. E. Reynolds	Massachusetts
B. D. Robbins	North Carolina
J. Roque	Porto Rico
L. Rossman	Maryland
L. Ruiz	Porto Rico
R. J. Sheppe	Maryland
W. J. Smullems	Connecticut
J. A. N. Thibert	Massachusetts
M. J. Tynan	Connecticut
F. H. Underwood	North Carolina
J. L. Venoit	Canada
L. E. Wallace	West Virginia
F. O. Warren	Massachusetts
J. E. Warren	Massachusetts
W. T. Weston	Massachusetts

MEDICO-CHIRURGICAL COLLEGE, DEPARTMENT OF DENTISTRY.

THE thirty-fifth annual commencement exercises of the Medico-Chirurgical College, Department of Dentistry, were held in the Academy of Music, Philadelphia, Pa., on Friday, June 4, 1915.

The doctorate address was delivered by the Hon. Clinton Rogers Woodruff.

The degree of Doctor of Dental Surgery was conferred by Mr. David Milne, president of the board of trustees, on the following graduates:

Eduardo F. Avila ..... Venezuela, S. A.	Phila Label ..... New York
Benjamin M. Axelrad ..... New York	Arturo Lacayo ..... Nicaragua, S. A.
Edward W. Barton ..... Pennsylvania	Isaac Levy ..... Connecticut
Arthur W. Bauman ..... Pennsylvania	George E. Little ..... Pennsylvania
Paul E. Bomberger ..... Pennsylvania	Louis Lünch ..... Pennsylvania
Arthur T. Burchill ..... Pennsylvania	Julio C. Midence ..... Nicaragua, S. A.
Henry S. Burtis ..... New Jersey	Norberto S. Moya ..... Cuba
Herman E. Coane ..... Pennsylvania	James J. Munley ..... Pennsylvania
Carlton T. Creasy ..... Pennsylvania	Erasmo J. Pedraza ..... Cuba
Robert Davis ..... Pennsylvania	Octavio B. Pinho ..... Brazil, S. A.
John C. Dickinson ..... New Jersey	Luis M. Rodriguez ..... Cuba
Frank S. Effron ..... Pennsylvania	John W. Shuman ..... Pennsylvania
John A. Ennis ..... New York	John J. Small ..... Pennsylvania
Jacob S. Goldstein ..... New York	J. G. Stewart ..... Pennsylvania
Pablo F. R. Gómez ..... Dominica	J. Donald Stone ..... Pennsylvania
James L. Green ..... Connecticut	Harold E. Story ..... New York
Jorge A. C. Gutierrez ..... Columbia, S. A.	Ernest J. Strauss ..... Germany
Louis Hecker ..... New York	J. Stuart Tait, Jr. ..... Pennsylvania
Alfredo M. Herrera ..... Cuba	Charles E. Templeton ..... Oregon
Allen H. Hetler ..... Pennsylvania	Asher J. Tilton ..... Pennsylvania
Fontaine M. Hite ..... Virginia	Edward A. Toplitske ..... Connecticut
Ralph H. Husted ..... Pennsylvania	F. Roland Wessels ..... Pennsylvania
Vahan M. Jeskalian ..... Armenia	Warren A. Wood ..... New Jersey
William R. Jones ..... Pennsylvania	Grover F. Zerbe ..... Pennsylvania

HINTS, QUERIES, AND COMMENTS.

AN ALCOHOL-SAVER.

A SHORT length of German-silver wire soldered to the regulating screw of the alcohol

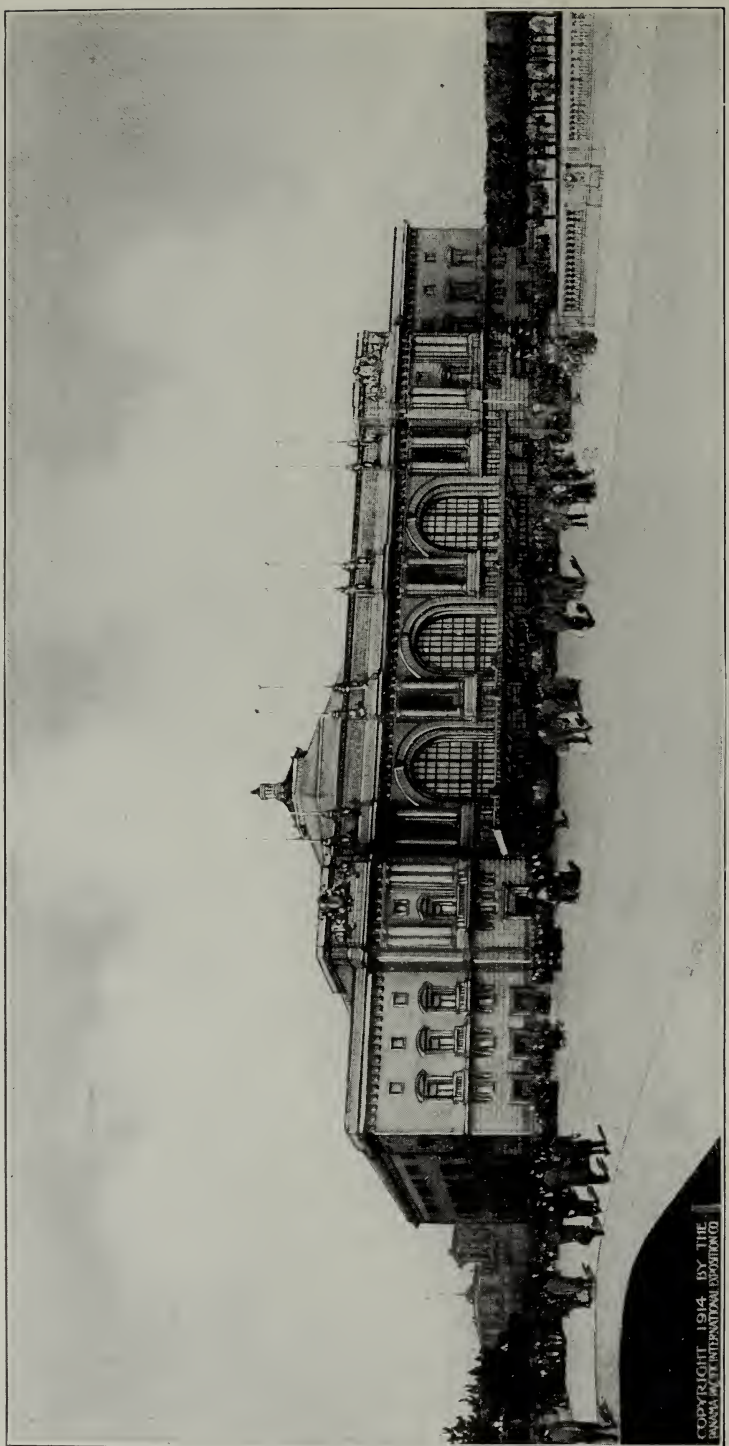
lamp, in the manner shown in the accompanying illustration, will be the means of saving half the alcohol usually burned in the alcohol lamp. A tap with an instrument or the mouth-mirror, on one end of the wire, turns the lamp down, and a tap on the other end turns it up full again.

For adjusting, the lamp is set in the position wished for, low, and then the wick is cut off level with the top of the lamp.

Since fixing this attachment to my lamp, I have used in it just one-half the spirit that I formerly required in the same period of time.

C. M. TORRANCE, D.M.D.

Frankfurt a/M., Germany.



New Municipal Auditorium, San Francisco,

WHERE THE PANAMA-PACIFIC DENTAL CONGRESS AND ASSOCIATED CONVENTIONS (WITH ALL CLINICAL DEMONSTRATIONS AND EXHIBITS) WILL BE HELD.

Society Notes and Announcements.

Panama-Pacific Dental Congress.

San Francisco, Cal., August 30 to September 9, 1915.

The following explanation of the meaning of the seal is given by Dr. Herbert J. Samuels, of Oakland, Cal., its designer: The female figure, representing Minerva, the Roman goddess of wisdom, especially the knowledge of arts and sciences, scientific and practical truth, surmounts the universe, and standing on a bank of clouds, offers on one hand the light of learning, typified by the torch, and on the other the reward of achievement and honor, symbolized by the laurel. The two spheres represent the name of the congress and the place of meeting. On the right of the figure is the Western hemisphere with the two oceans which have been made one by the Panama Canal, and on the left is the "Golden Gate," the Bay of San Francisco, and the wonderful city on its shores. The fruits and flowers furnish a pleasing setting for the year, "1915," and signify that the country in which the congress will be held abounds in fruitful opportunities and blessings.

OPENS AUG. 30TH, 1915

THE SEAL.

Officers.

President—Frank L. Platt, 323 Geary st., San Francisco.
Vice-president—Chas. M. Benbrook, Auditorium Bldg., Los Angeles.
Secretary—Arthur M. Flood, 240 Stockton st., San Francisco.
Treasurer—Fred G. Baird, Butler Bldg., San Francisco.

Committee of Organization.

Chairman—Frank L. Platt, 323 Geary st., San Francisco.
Vice-chairman—Arthur W. Chance, Corbett Bldg., Portland, Ore.
Secretary—Arthur M. Flood, 240 Stockton st., San Francisco.
Treasurer—Fred G. Baird, Butler Bldg., San Francisco.
M. A. Frederick, 2152 Sutter st., San Francisco.
Joseph Loran Pease, Central Bank Bldg., Oakland, Cal.
H. G. Chappel, Oakland Bank of Savings, Oakland, Cal.
C. F. Jarvis, First National Bank Bldg., Oakland, Cal.
R. B. Giffen, Hagelstein Bldg., Sacramento, Cal.
T. Sydney Smith, Palo Alto, Cal.
Chas. M. Benbrook, Auditorium Bldg., Los Angeles, Cal.
Geo. T. Williams, Cobb Bldg., Seattle, Wash.
Geo. F. Stiehl, Judge Bldg., Salt Lake City, Utah.
H. H. Wilson, Phœnix, Arizona.
Albert A. Jessup, Boise, Idaho.

Conventions which will meet with the Panama-Pacific Dental Congress.

Fédération Dentaire Internationale.
National Dental Association.
Research Commission of National Dental Association.
National Association of Dental Examiners.
American Society of Orthodontists.
Association of Military Dental Surgeons.
California State Dental Association.
Southern California Dental Society.
Utah State Dental Society.
Salt Lake County Dental Society.
Delta Sigma Delta Dental Fraternity.
Psi Omega Dental Fraternity, Nat'l Alumni.
Xi Psi Phi Fraternity.

FROM THE COMMITTEE OF ORGANIZATION.

THE Committee of Organization desire to announce that the Congress will open on time, with an exceptionally good program.

The following is a partial list of the papers to be given at the Panama-Pacific Dental Congress:

Partial Program.

"The Evolution and Development of the Mandible." Dr. Martin Dewey, Kansas City, Mo.

"Anomalies in Dental Pulp Structures and Their Relation to Clinical Work." Dr. Vida A. Latham, Chicago, Ill.

"Research on the Resistance of the Red Corpuscles of the Blood of the Human Gums (Normal and Pathological) to the Diluted Salt Solution." Prof. Amigo Piperno, Rome, Italy.

"A Brief Synopsis of a Paper Entitled 'An Investigation of Mottled Teeth: An Endemic Affection Not Heretofore Known.'" Dr. Fred S. McKay of Denver, Colo., in collaboration with Dr. G. V. Black of Chicago, Ill.

"The Value of Bacterial Vaccines in the Treatment of Pyorrhea." Dr. Geo. B. Harris, Detroit, Mich.

"Radiography in Dentistry and Orthodontia." Dr. Brownlee of Chicago, Ill., and Dr. Ketcham of Denver, Colo.

"The Etiology of Dental Abscesses, Acute and Chronic." Dr. Thos. B. Hartzell, Minneapolis, Minn.

"Acidometric Study of the Saliva and Its Relation to Diet and Caries." Dr. John S. Marshall, San Francisco, Cal.

"An Investigation of the Character of the Various Dental Cements." Dr. Marcus L. Ward, Ann Arbor, Mich.

"Some Refractory Materials Used in Dentistry." Dr. Guy S. Millberry, San Francisco.

"Report on Dental Clinical Work in the Hospitals, Schools, and Prisons in Manila, P. I." Dr. Louis Ottofy, Manila, P. I.

"The Educational Value of Oral Hygiene in the Army." First Lieut. Dr. Edwin P. Tignor.

"The Agencies in Ohio Co-operating in a General Hygiene Educational Campaign." Dr. Homer C. Brown, Columbus, Ohio.

"Hygiene in the Bucco-dental Cavity as an Important Auxiliary for the Prophylaxis of Incipient Bucco-pulmonary Tuberculosis." Dr. Ernesto A. Dam, Lima, Peru.

"Bad Root-canal Work: What Shall We Do About It?" Dr. Howard R. Raper, Indianapolis, Ind.

"Pain—Its Significance and Value as a Diagnostic Symptom, Its Advantages and Disadvantages, and the Importance of Its Alleviation and Prevention." Dr. E. T. Loeffler, Ann Arbor, Mich.

"Superstitions of Dental Medicine." Dr. Garrett Newkirk, Pasadena, Cal.

"Therapeutic and Surgical Treatment of Roots and Their Adjacent Tissues." Dr. J. F. Biddle, Pittsburgh, Pa.

"The Therapeutics of Radicular and Follicular Dental Cysts." Prof. Dr. Rudolph Weiser, Vienna, Austria.

"A Few Thoughts on the Comparative Anatomy of the Maxillary Sinus, Its Relation of the Teeth, Mandibular Articulation, and Alimentary System." Dr. Matthew H. Cryer, Philadelphia, Pa.

"Radium Treatment of Carcinoma." Dr. Oscar Strauss, Milwaukee, Wis.

"A Case of Acromegaly." Dr. P. Gadd, Helsingfors, Finland.

"Etiology and Treatment of Oral Tumors." Dr. Fulton Risdon, Toronto, Canada.

"What is the Line of Occlusion?" Dr. R. Ottolengui, New York, N. Y.

"An Attempt Toward Anatomical Articulation." Dr. Subirana, Madrid, Spain.

"Some Practical Uses in Dental Practice for Tungsten and Molybdenum." Dr. W. A. Price, Cleveland, Ohio.

"A Method of Surveying and Mapping the Dental Apparatus." Dr. F. L. Stanton, New York, N. Y.

"The Plantation of Teeth." Dr. M. J. Congdon, Berkeley, Cal.

"Cavity Preparation for Gold Inlays." Dr. John Conzett, Dubuque, Ia.

"The Recessional Lines of Pulps in Their Relation to Operative Dentistry." Dr. H. G. Chappel, Oakland, Cal.

"Operative Procedures in Relation to Dental Caries and Diseases of the Investing Tissues." Dr. Arthur D. Black, Chicago, Ill.

"Anoci-Association in Dental Operations." Dr. R. H. Riethmüller, Philadelphia, Pa.

"Technique in the Treatment of Pulps, Root-canal, and Periapical Area." Dr. M. L. Rhein, New York, N. Y.

"Peridental Anesthesia, Intraosseous Method." Dr. Frank L. Platt, San Francisco.

"The Successful Scientific Treatment of Periodontal Diseases." Dr. T. Sydney Smith, Palo Alto, Cal.

"Pyorrhea Alveolaris, Showing the Pathological Changes Occurring in the Alveolus, Based on Microscopic Observation." Dr. Fred Hecker, Kansas City, Mo.

"The Endamœba Buccalis as Seen Through the Microscope, Illustrated by Moving-picture

Film and Lantern." Dr. H. Page Bailey, Los Angeles, Cal.

"Impression Material and Impressions." Dr. Geo. H. Neilson, Cleveland, Ohio.

"Crown and Bridge." Dr. H. J. Goslee, Chicago.

"Some Fundamental Things in Dental Prosthesis." Dr. J. Leon Williams, New York, N. Y.

"Some Grave Errors in the Practice of Crown and Bridge Work." Dr. Vincenzo Guerini, Naples, Italy.

"Indications for and Construction of a Rubber Obturator that is Retained Only by Action of the Soft Tissues." Dr. Calvin S. Case, Chicago, Ill.

"The Development of Dental Service in the Navy." Dr. Emory A. Bryant, Washington, D. C.

"Nomenclature." Dr. Arthur D. Black, Chicago, Ill.

"Dental Society Organization." Dr. C. S. McCord, Seattle, Wash.

THE exhibit space at the disposal of the committee is occupied, and no other congress has had such a complete exposition of dental and pharmaceutical goods as will be presented. Everything points to a large and successful meeting. A complete exhibit will be given of all that pertains to Oral and School Hygiene and Sanitation. All will be held in San Francisco's New Municipal Auditorium, five minutes' ride from the hotel and business sections of the city.

The Membership Committee urges all who expect to attend, to fill out their application blanks, have them signed by a member of the Executive Committee of the state in which they reside, and forward with check, draft, or P. O. money order for Ten Dollars to the secretary, Dr. A. M. Flood, 240 Stockton st., San Francisco. This should be done as soon as possible, as it will save the dentist considerable trouble and annoyance, and will facilitate the work of registration. Those who have not paid for their membership, nor filed their applications for membership, properly indorsed, but expect to obtain membership in the Panama-Pacific Dental Congress upon reaching San Francisco, must make provision to secure proper credentials from their state or local dental society, to file with their application. Those not members of any dental society must secure the indorsement of a member of the Executive Committee from the state in which they reside.

REGISTRATION.

Register early! The Bureau of Registration will be located in the Exposition Memorial Auditorium, at Grove, Larkin, Hayes, and Polk sts. A branch Post-office and Bureau of Information will be established in connection with the Registration Bureau. Members must register in order to obtain the official program and invitations to entertainments. All are urged to register as soon as they can name their hotels. The Registration department will be open from 8.30 A.M. to 5.30 P.M. on Monday, August 30, 1915, and these hours will be kept each succeeding day during the congress, as long as necessary for the accommodation of those wishing to register. Be sure to bring the membership card sent you from the San Francisco office when you paid your membership fee.

HOTEL RESERVATIONS.

Although San Francisco can easily accommodate all those in attendance at the Panama-Pacific Dental Congress, members are urged to make their hotel reservations early. It will be a great comfort upon arriving in San Francisco to go at once to an hotel that is expecting you, rather than to make a round of hotels, finding a number of them completely filled, and finally being compelled to take the first lodgings which can be found in a hurried personal search. Reservations may be made through the San Francisco Hotel Bureau, Kearny and Market sts., San Francisco, or through the Exposition Tour Service Co., 155 Sutter st., San Francisco. Take the reply you receive with you to San Francisco, then on arriving all you will have to do is to go to this hotel and register. In requesting an hotel reservation be sure to state your full name and home address, the date you expect to reach San Francisco, the number in your party, the number of rooms required, the rate per day per person, per room, you are willing to pay, and the hotel you prefer, if any.

As far as possible no night sessions of the congress will be held, leaving the evenings free for entertainment and the Exposition. All the sessions of the congress, the meetings of the sections, component societies, and the exhibits, will be held under one roof, in the Municipal Auditorium, one of the most magnificent structures of its kind, affording every opportunity for the effective and comfortable presentation of the program.

No one interested in the history, progress and practice of dental science and art can afford to miss this great opportunity to attend the congress and at the same time visit the greatest International Exposition the world has ever seen.

ARTHUR M. FLOOD, *Secretary.*

FROM THE TRANSPORTATION COMMITTEE.

Hy. Woods Weirick, *ch'man,* 503-6 Mechanics' Bldg., San Francisco.
Harry P. Evans, 44 E. 64th st., New York, N. Y.
E. M. Carson, 1115 Union Bldg., Seattle, Wash.
Chas. F. Fiset, Cobb Bldg., Seattle, Wash.
J. D. Eby, 519 Grant Bldg., Atlanta, Ga.
Alpheus R. Brown, 201 Clarendon st., Boston, Mass.
R. W. Berthel, Lowry Arcade, St. Paul, Minn.
F. W. Gethro, 122 S. Michigan ave., Chicago, Ill.

The Tour.

The Transportation Committee of the Panama-Pacific Dental Congress has endeavored to furnish a schedule of train service which would afford the greatest amount of comfort, sightseeing, and pleasure, with the least amount of fatigue and inconvenience, at a minimum of expense for all those coming from eastern points. Following is the schedule adopted:

		Aug.	via
lv Boston	12.00 mid.	22	N.Y.N.H.& H.
ar New York	7.00 a.m.	23	"

Change from Grand Central to the Pennsylvania station.

		Aug.	via
lv New York	2.04 p.m.	23	Pennsylvania
lv Newark	2.27 p.m.	23	"
lv Philadelphia	4.31 p.m.	23	"
lv Harrisburg	7.25 p.m.	23	"
lv Altoona	11.00 p.m.	23	"
lv Pittsburgh	*c.t.* 1.35 a.m.	24	"
lv Columbus	7.00 a.m.	24	"
lv Logansport	1.15 p.m.	24	"
ar Chicago	5.00 p.m.	24	"

Train to be switched to Chicago & Northwestern station. A few hours for sightseeing and recreation in Chicago.

		Aug.	via
lv Chicago	10.45 p.m.	24	Ch'go & N.W.
lv Cedar Rapids	6.00 a.m.	25	"
lv Marshalltown	8.18 a.m.	25	"
lv Ames	9.50 a.m.	25	"
ar Omaha	3.45 p.m.	25	"
lv "	4.20 p.m.	25	Union Pacific
lv Grand Island	8.20 p.m.	25	"
ar Denver	7.30 a.m.	26	"
lv "	7.45 a.m.	26	Den. & Rio G.
ar Colorado Spgs.	10.30 a.m.	26	"

Spend day and night here for sightseeing.

		Aug.	via
lv Colorado Spgs.	10.55 a.m.	27	Den. & Rio G.
lv Royal Gorge	1.50 p.m.	27	"
lv Glenwood Spgs.	10.10 p.m.	27	"
ar Salt Lake City	12.01 m.	28	"
lv " " "	1.45 p.m.	28	Wes'n Pacific
lv Feath. Riv. C'yon	7.00 a.m.	29	"
ar San Francisco	5.45 p.m.	29	"

Passengers from following points should leave as follows to join special train:

		Aug.	via
lv Washington	3.10 p.m.	23	Pennsylvania
lv Baltimore	4.20 p.m.	23	"
ar Harrisburg	6.40 p.m.	23	"
lv Louisville	8.20 a.m.	24	"
lv Indianapolis	11.40 a.m.	24	"
ar Chicago	5.40 p.m.	24	"
lv Dayton	9.05 a.m.	24	"
ar Chicago	5.40 p.m.	24	"
lv Cleveland	7.20 a.m.	24	Lake Shore
lv Toledo	10.05 a.m.	24	"
ar Chicago	4.00 p.m.	24	"
lv Buffalo	11.00 p.m.	23	"
ar Chicago	11.50 a.m.	24	"
lv Detroit	12.30 p.m.	24	Mich. Central
ar Chicago	7.40 p.m.	24	"
lv Minneapolis	10.05 p.m.	24	Ch'go & N.W.
lv St. Paul	10.40 p.m.	24	"
lv Sioux City	7.50 a.m.	25	"
ar Omaha	11.25 a.m.	25	"
lv Des Moines	8.30 a.m.	25	"
ar Ames	9.35 a.m.	25	"
lv St. Louis	Evening	24	Any Line
lv Kansas City	"	24	"
ar Omaha	Morning	25	"

Railroad Fares.

Going via the route of the official train to San Francisco, Cal., thence returning via any direct line from California, rates will be as follows: From Boston, $106.75. New York City, $98.80. Philadelphia, $95.20. Chicago, $62.50. Going via route of official train to San Francisco, thence to Los Angeles and returning via North Pacific Coast (Portland, Seattle, or Vancouver), the cost will be $17.50 higher (destination of tickets, San Francisco), with an additional charge of $4.00 if side trip, Los Angeles to San Diego and return, is desired. The entire route must be selected at the time tickets are purchased. Correspondingly low rates from your home station.

Sleeping-car rates to San Francisco.

From	Lower.	Upper.	Compartment.	Drawing-room.
New York	$20.00	$16.00	$56.00	$71.00
Philadelphia	19.50	15.60	55.00	69.00
Chicago	15.00	12.00	42.00	53.00
Omaha	13.00	10.40	36.50	46.00

General Information.

In order to secure sleeping-car accommodations, make application as soon as possible.

You may have your mail sent to you in care of Panama-Pacific Dental Congress, Exposition Memorial Auditorium, San Francisco, Cal.

On account of the heavy travel it would be advisable to make hotel reservations in advance, and these can be secured through the Official Exposition Hotel Bureau, Flannery Bldg., San Francisco, Cal.

Literature descriptive of the route of travel, the Expositions, etc., will be sent you on request.

COMMITTEE ON TRANSPORTATION.

For those going from *southern points* to San Francisco, information on transportation and rates was published in the May COSMOS—see page 596.

N. D. A. booklet.

Valuable information regarding various routes and the sightseeing attractions offered by each, time tables, fares, reservations, etc., is contained in the beautifully illustrated booklet published by the National Dental Association, and entitled "Panama-Pacific Dental Congress: Special Trains to San Francisco," which may be had upon application to any member of the

N. D. A. Transportation Committee.

VICTOR H. JACKSON, *ch'man*, New York. (40 E. 41st st.)
H. F. HOFFMAN, Denver, Colo. (524 Metropolitan Bldg.)
JOS. E. EBY, Atlanta, Ga. (521 Grant Bldg.)
D. C. BACON, Chicago, Ill. (31 N. State st.)
HY. W. WEIRICK, San Francisco. (503 Mechanics' Bk. Bldg.)
J. P. MARSHALL, St. Louis, Mo. (Maple Wood.)

"F. D. I."

INTERNATIONAL DENTAL FEDERATION.

Meeting at San Francisco, September 2 and 3, 1915.

THE next meeting of the International Dental Federation will be held September 2 and 3, 1915, at San Francisco, Cal. Headquarters will be at the Clift Hotel.

TRUMAN W. BROPHY, *President*,
BURTON LEE THORPE, *Asst. Sec'y*,
3605 Lindell Blvd., St. Louis, Mo.

ASSOCIATION OF MILITARY DENTAL SURGEONS.

THE annual meeting of the Association of Military Dental Surgeons will be held at San Francisco, Cal., September 1 and 2, 1915.

WM. C. FISHER, *President*,
New York, N. Y.

AMERICAN SOCIETY OF ORTHODONTISTS.

THERE will be a meeting of the American Society of Orthodontists held on Monday, August 30, 1915, at 9.30 A.M., at San Francisco, Cal., in the room assigned to the Orthodontia Section of the Panama-Pacific Dental Congress. It is respectfully requested that as many members of the American Society of Orthodontists as possible be present.

F. C. KEMPLE, *President*,
F. M. CASTO, *Sec'y-Treas.*

DELTA SIGMA DELTA FRATERNITY.

THE thirty-first annual meeting of the Supreme Chapter of Delta Sigma Delta Fraternity will be held in the Auditorium Building, San Francisco, Cal., Wednesday, September 1, 1915, at 10 A.M. At this meeting the regular order of business will be carried out, to be followed by initiatory exercises in the afternoon. The annual banquet will be held at the St. Francis Hotel, at 7 P.M. The headquarters of the Fraternity will be at the Clift Hotel.

By order of the Supreme Chapter.

BURTON L. THORPE, *Supreme Grand Master*,
R. HAMILL D. SWING, *Supreme Scribe.*

DEWEY SCHOOL OF ORTHODONTIA.

ALUMNI ASSOCIATION.

THERE will be a meeting of the Alumni of the Dewey School of Orthodontia, at the Baltimore Hotel, Kansas City, August 18, 19, and 20, 1915.

A. C. GIFFORD, *Sec'y.*

UTAH STATE DENTAL SOCIETY.

WANT TO ENTERTAIN VISITING DENTISTS.

THE Utah State Dental Society desire to entertain all dentists who visit Salt Lake City or Ogden. This we shall be very glad to do, if we are notified when they, individually or collectively, will arrive in either of these towns.

EARL G. VAN LAW,
Chairman Entertainment Committee.
913 Walker Bk. Bldg., Salt Lake City, Utah.

ARMY DENTAL SURGEONS.

Memoranda of Changes.

For the week ending Saturday, May 22, 1915:

Acting Dental Surgeon Lowell B. Wright is relieved from duty at Madison Barracks, N. Y., at such time as will enable him to comply with this order, and will proceed to San Francisco, Cal., taking the transport to sail from that place on or about September 5, 1915, for the Philippine Islands, reporting on arrival at Manila, P. I. (in person) to the Commanding General Philippine Department for assignment to duty.

Acting Dental Surgeon Charles De Witt Deyton is relieved from duty in the Philippine Department on or about September 15, 1915, and will take the transport to sail from Manila, P. I., on or about that date, for the United States, reporting for further orders in compliance with provisions of General Orders No. 80, October 24, 1914, War department.

For the week ending Saturday, May 29th:

Upon the arrival at Honolulu, Hawaii, of the transport scheduled to leave Manila, P. I., on or about July 15th, Acting Dental Surgeon Edwin M. Kennedy will proceed on that transport to San Francisco, Cal., and upon arrival at that place will report (in person) to Maj. Roger Brooke, Medical Corps, president of the examining board at the Letterman General Hospital, Presidio of San Francisco, Cal., appointed in paragraph 18, S. O. No. 239, Oct. 10, 1914, War Dep't, for examination to determine his fitness for appointment as dental surgeon with rank of first lieutenant; and upon the completion of the examination will return to his proper station by the first available transport.

United States Patents

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING JUNE 1915.

June 1.

No. 1,141,788, to James Martin Feerick. Casting apparatus.

June 8.

No. 1,141,916, to Julius Aderer. Pliers.

No. 1,142,024, to Edward L. Chott. Dental tool.

No. 1,142,130, to Charles H. Wardwell. Container for paste.

No. 1,142,356, to Charles V. Nellany. Tooth-brush.

No. 1,142,385, to Frank T. Van Woert. Artificial tooth.

No. 1,142,467, to Wm. Ernest Walker. Orthodontia appliance.

No. 1,142,566, to Carl A. Jackson. Tooth-brush.

June 15.

No. 1,142,790, to Edward H. Angle. Orthodontia appliance.

No. 1,142,897, to Albert F. Libbey. Artificial teeth.

No. 1,143,432, to Berthold Proskauer and Adolf Irrgang. Apparatus for making dental crowns and molar projections.

No. 1,143,443, to Adolph W. Schramm. Instrument table.

No. 1,143,515, to Wm. F. Dunlop. Jaw-prop.

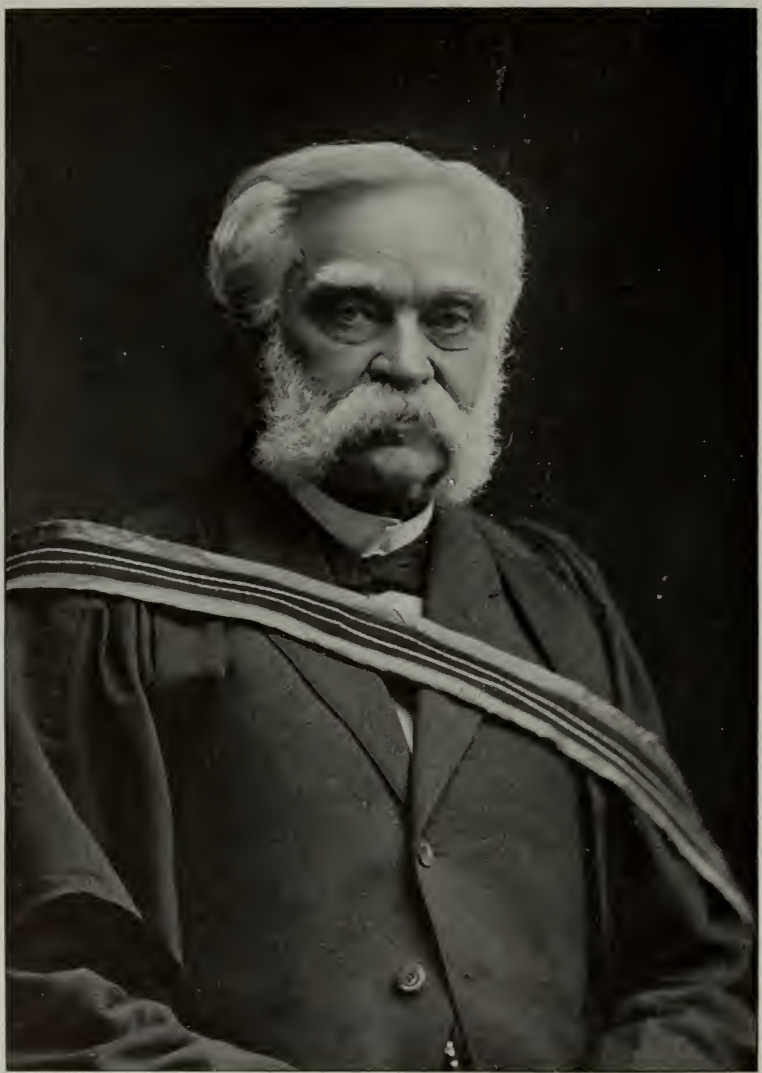
June 22.

No. 1,143,927, to Willis Edw. Allen. Combination dental instrument.

No. 1,144,336, to Geo. H. Whiteley. Artificial tooth.

June 29.

No. 1,144,777, to Edwin Gould Over. Sanitary tooth-cleaner.



DR. JAMES B. WILLMOTT

THE

DENTAL COSMOS.

VOL. LVII. SEPTEMBER 1915. No. 9.

ORIGINAL COMMUNICATIONS.

SOME ADVANTAGES OF JACKET CROWNS.

By WM. A. CAPON, D.D.S., Philadelphia, Pa.

(Read before the Dental Society of the State of New York, at its annual meeting, at Albany, May 13, 1915.)

THE dental practitioner of the present time has such a wide range of materials and controls so many methods that a conspicuous mouth is inexcusable, providing the patient has the means and the desire. The latter is generally present, but unfortunately not always accompanied by the former.

Dental conditions are so variant that it is impossible for every dentist, no matter how perfect his equipment may be, to compass all requirements, hence the tendency to branch and follow a particular line of work. This branch or specialty is generally chosen because of a peculiar ability of experience. Many of us feel competent to practice a variety of special phases, and are compensated by satisfactory results because these branches of dentistry are so closely allied that a division could be of no advantage.

There is no section of dentistry that presents a greater diversity of dental ability than that of covering or filling spaces by bridges, and a recognition of this fact will go far toward the elimination of much disfigurement, pain, and inconvenience.

Innumerable teeth have been sacrificed for the purpose of crowning, and thousands of good roots extracted for the purpose of bridging, and countless teeth ground and eventually twisted out of their sockets in an effort to circumvent the necessity for a plate. We all make mistakes, and we have experienced the mortification which results therefrom, and have vowed to be more observant in the future.

Every dentist uses crowns, whether it be a so-called pivot—which is a misnomer, although some of them *do* pivot exceedingly well, unfortunately for the possessor!—or a beautiful porcelain crown with a platinum base, and this is the most perfect of all pin or post crowns. Many operators are using the cast base, with very beautiful and satisfactory results. A small proportion are using what is called a jacket crown, but very few know the value and extent of its application.

EVOLUTION OF THE JACKET CROWN.

This crown derives its name from the fact that it envelops a portion of the natural crown, and thereby retains the original strength of the tooth to a greater degree than if the crown is trimmed to the gum margin and the retention of the substitute depends entirely upon a pin, post, peg, or so-called pivot extending into the enlarged canal of the root.

This class of work is not new; in fact, it is nearly thirty years since it was first used and given to the profession. To be accurate, it was in the year 1886 that Dr. Land described his crown as a "new method of covering teeth with porcelain." In later years the method has changed, until at the present time we have practically three kinds that can be properly placed under the term "jacket crown."

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4, A.

FIG. 4, B.

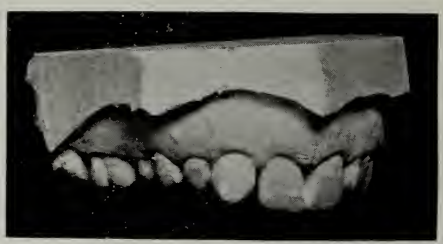


FIG. 5.

The original of this class consisted of a frame or sheath of platinum covering the prepared tooth, as shown in Fig. 1, and a porcelain veneer fused to the labial surface, leaving the lingual surface exposed, the platinum and the whole shell being cemented to place. The second

Fig. 6.

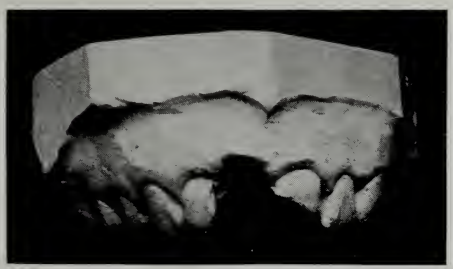
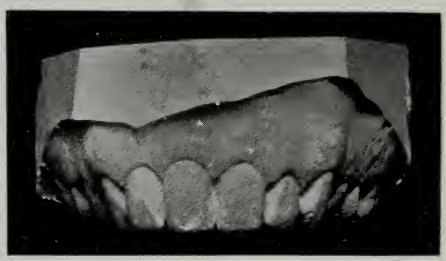


Fig. 7.



type of jacket crown requires greater cutting of the natural tooth, because the lingual surface is also porcelain. The frame is of thin foil, which is entirely removed, leaving an all-porcelain shell. (See Fig. 2.)

The third type of this crown is of more recent production, and Dr. Land

Fig. 8.

Fig. 9.

calls it the "overlap," because it overlaps the tooth mesially and distally without covering the lingual portion. This crown is also made on a foil base, and the metal stripped from it before the crown is cemented into place. The advantage of this crown over that shown in Fig. 2 lies in the absence of cutting

jacket crown for many years, and the pictures I will show of some extreme cases may help to justify my confidence.

INDICATIONS FOR THE JACKET CROWN.

Before presenting these cases allow me to state my position regarding crowns,

and to place them in their proper class. They are all of the highest order of dental reparation or substitution, but the original jacket crown is my favorite, because it has practically no limitation. It is sometimes criticized as being bulky, and it is claimed that the shade cannot be controlled because of the platinum

background, but in this work, as in other dental operations, much depends on the operator. No doubt the work of twenty years ago or even of more recent date deserved this criticism, but most of it is still in use and acceptable in appearance. Hundreds of these crowns were placed in almost hopeless cases where no

Fig. 10.

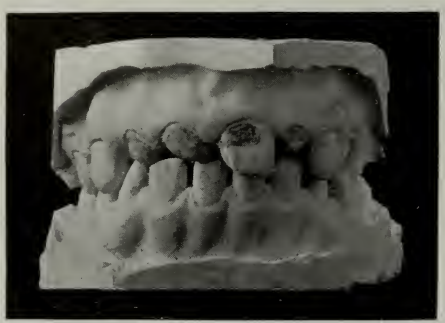
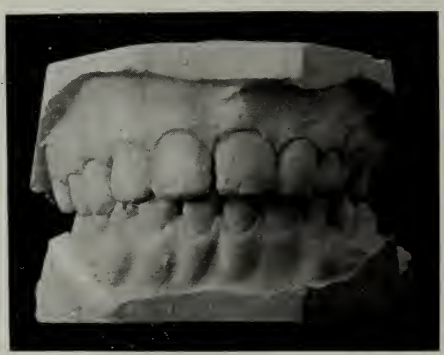


Fig. 11.



other substitute was possible, and they are holding their own with more perfect neighbors. Vital pulps, devitalized teeth, fractured roots, torsion teeth, "peg" or "rice" teeth, bridge abutments, deformities of all kinds, including regu-

Fig. 12.

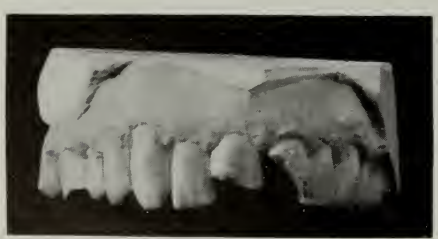


Fig. 13.

lating, constitute the field for this kind of crown.

Bicuspids, molars, and lower incisors are worth mentioning also, for when the lower incisors are bad, they are generally very bad, and what kind of a pin crown can be used there with satisfaction? The roots are narrow and too small for any degree of enlargement without danger of perforation, yet the position requires great strength in the substitute, for the leverage is enormous for a small tooth. The application of a jacket crown is just as satisfactory in these instances as in any other place in the mouth.

How much of this field will the other jacket crowns cover?—for they are practically alike in their application. They are useful just in proportion to the amount of tooth substance which is left to be covered. They are dependent upon a considerable amount of the original structure, and if that is present, there is an opportunity of making a natural-appearing and strong crown unsurpassed by any other we know of. They are particularly adapted to covering darkened teeth which have been devitalized, and the overlap crown designated by me, as shown in Fig. 3, has the advantage of necessitating less cutting of the natural tooth. The lingual surface is

open and therefore reduces bulk, and allows access in case of treatment. These crowns must be used individually; therefore they have no value as a bridge abutment, and cannot be united for the strength which is sometimes required when the roots are affected by pyorrhea.

All jacket crowns of the porcelain variety are exceedingly strong if they are correctly made, and, as they are not of the "cheap" variety, there is no reason for not giving time and attention to detail, and thereby reducing the possibility of failure. These crowns being shells,

FIG. 14.

FIG. 15.

ADVANTAGES.

The skill required in making this crown consists largely in the fusing of the porcelain and strict attention to technical detail, but any dentist with a fair amount of experience in making inlays or using porcelain may expect good results, and increase his field of operations extensively.

there is no possible chance of reducing the value of the foundation in case of breakage, and the repairing is a much simpler operation than is the repairing of any other crown. This statement applies particularly to the platinum-base jacket crown. Figs. 1, 2, and 3 show the general form after preparation and the crowns ready for application.

PRACTICAL CASES.

Fig. 4, A and B, represents the case of a young man of twenty-two years. The central incisors are normal in appearance and are in correct position, but the right lateral incisor is displaced by the canine and is not in alinement with the centrals. The left lateral is malformed or what is termed a "peg" or "rice" tooth. The deciduous canine on the same side is firmly in position between the lateral and permanent canine. The position of the right canine is held by the deciduous canine, and the second bicuspid is also malformed. A radiograph fails to show the presence of the missing right lateral.

Fig. 5 is the case corrected with jacket crowns. The right canine was devitalized and trimmed sufficiently for a lateral, and the deficiency of space taken up by the enlarged canine covering the deciduous tooth. The exposed section at the gingival border was covered by a gum enamel inlay.

Fig. 6 represents the case of a young student athlete. The right central had been broken by an accident some years ago, and replaced by a pin crown. A recent blow broke it again and split the root lingually, also breaking the lateral and left central.

Fig. 7 shows the case corrected by three jacket crowns. The right central root was reinforced by a screw post and amalgam. The platinum frame of the crown was carried well under the gum to the margin of the fracture, and at the

Fig. 16.

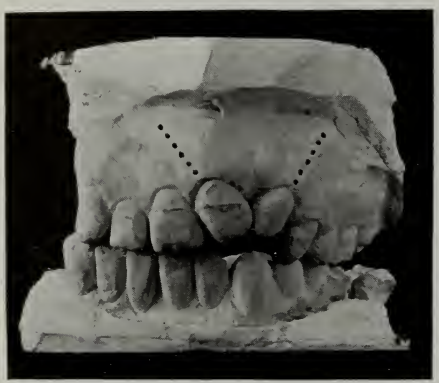


Fig. 17.

Fig. 18.

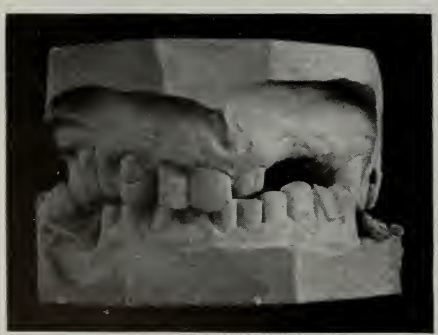
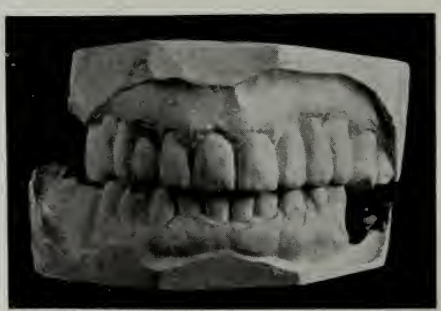


Fig. 19.



present time the tissue is almost in its normal position.

Fig. 8 represents the mouth of a retired well-known Philadelphia dentist, who during a severe illness broke the left canine, lateral, and central. The pulps being vital and not exposed, these teeth were crowned, in 1909. The right lateral had been crowned in 1892. This crown was re-cemented a few months ago, and the tooth is apparently as near to normal as when it was first crowned twenty-three years ago. (See Fig. 9.)

Fig. 10 shows the case of a boy of seventeen years, who had been a sickly child, and had always had poor teeth. He was placed in my charge by a dentist from another city. In two sittings of two and one-half hours each, in the morning and afternoon of the same day, his teeth were restored as shown in Fig. 11.

Fig. 12 shows the case of a man who had been thrown from his horse. The crown and root of the left central was fractured and the pulp of the right central killed by the shock. The restoration is shown in Fig. 13.

Fig. 14 shows the case of a young lady with a contracted arch and irregular teeth. She wore a plate with two small canines to fill the spaces. She had for two years undergone orthodontic treatment, but with little success. Her speech was affected by the plate, which was an "insult added to injury," because of the enlarged condition of the jaw. The condition was corrected by two small extension bridges, using jacket crowns on the right and left laterals as abutments. (See Fig. 15.)

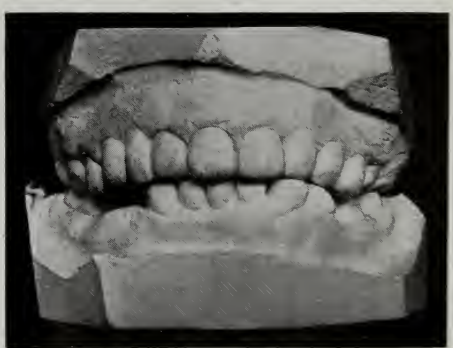
Fig. 16 shows the space between occluding surfaces caused by non-eruption

Fig. 20.

Fig. 21.

Fig. 22.

Fig. 23.



of the left lateral incisor and the angle formed by the left central and canine. This case was corrected by two jacket crowns, which produced a marked improvement in speech and appearance. (See Fig. 17.) The pulp of the central was devitalized, because the angle of the tooth required extreme cutting. The dark patch shows a gum enamel inlay made to make the central more complete.

Fig. 18 is a recent case selected to show the use of the jacket crown as a bridge abutment. This patient is fifty-six years of age, and a tobacco-chewer, hence considerable confidence must be placed in the strength of this crown under such circumstances. (See Fig. 19.)

Fig. 20 represents an extreme condition of abrasion, which was corrected largely by the use of the jacket crown. The lower anterior bridge was supported by these crown abutments and stood the strain for ten years, after the facings of the soldered teeth had been broken away. (See Fig. 21.)

Fig. 22 is the case of a girl of fifteen, the most extreme of its class. Every tooth was devoid of enamel and stained dark brown, with several teeth unerupted. The bite was raised by shell crowns on the molars, and sixteen other teeth were covered with jacket crowns. No devitalization was necessary, the only inconvenience and pain being caused by the preparation of the teeth at the gingival margins. The remaining spaces were left for the possible delayed eruption of teeth. This was the most extensive reparation I have made, and a dental success, but the change in facial expression was much objected to by the child's mother. (See Fig. 23.)

Fig. 24 is a recent case and represents the mouth of a man of thirty-six. This condition was caused by neglect through discouragement, for the patient had had much dental work done, but failed to keep it in presentable condition. He is wearing partial upper and lower gold dentures to supply molars. Gum enamel was fused to the margins of the centrals to replace the receded gum. In order to make a strong clasp tooth on the left side, I united the two bicuspids, which were loose and had an extreme forward angle, made a foundation covering both teeth, and then carved what could be called "twin teeth;" thereby securing stability and natural appearance by correcting the angle and unsightly condition. (See Fig. 25.)

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Fig. 24.

Fig. 25.

A NEW METHOD FOR INDICATING NORMAL AND ABNORMAL RELATIONS OF THE TEETH TO THE FACIAL LINES.

By J. A. W. VAN LOON, M.D., D.D.S., Utrecht, Holland,
LECTURER IN DENTO-FACIAL ORTHOPEDIA AT THE RYKS UNIVERSITY, UTRECHT.

(I.)

THE want of a method for enabling us to form an exact diagnosis of patients having occlusal anomalies must certainly be felt by everyone engaged in dento-facial orthopedia, and not the least by the teacher of this branch of dentistry. Systematic diagnosis is not only insufficiently treated but even altogether ignored in text-books on dento-facial orthopedia. As regards the etiology of occlusal anomalies they are also inadequately dealt with, for the reason that too much attention is bestowed on the teeth alone and not on their relation to the remaining parts of the facial skull. On the other hand, treatment in association with the problem of the appliances appertaining thereto—*i.e.* the technical branch of dento-facial orthopedia—has reached an advanced stage of development.

It is clear to those who study dento-facial orthopedia upon a broad general medical basis, that the development of this science has proceeded on wrong lines. Treatment without correct diagnosis and without a proper knowledge of the etiology cannot but lead to bad results.

In this paper I will describe a method of examination whereby the making of a diagnosis of occlusal anomalies can be directed on new and more correct lines, showing at the same time the defects of the method hitherto followed.

ITEMS IN THE DIAGNOSIS OF OCCLUSAL ANOMALIES.

The diagnosis of an occlusal anomaly is usually made as follows:

(1) By taking the history as obtained from data given by the patient himself or his relatives, as regards age, general constitution, rhachitis, mouth-breathing, cutting and shedding of the teeth, heredity, habits of childhood, extraction of teeth, etc.

(2) By objective examination, in the first place of the patient himself, whereby attention is given to (*a*) the teeth, (*b*) the physiognomy, (*c*) the relation of these to each other, and (*d*) the tongue, the tonsils, and the throat.

It is, however, clear that by this method of examination much will be missed by us, as it is not possible to learn the occlusion of the teeth on the lingual side, or to examine the mouth in respect to the symmetry of the teeth, as Alfred Körbitz has indicated. The relation of the whole set of teeth in occlusion to the physiognomy in a state of repose is also hidden from our view. In order to meet these difficulties, it is usual to take an impression of the teeth of the lower and upper jaw, including the alveolar process; the plaster models are then placed one on the other in the relative position as found in the patient, and the objective examination proceeds farther. In order to reproduce the physiognomy we may take a facial photograph or make a facial plaster cast. No one, however, in my opinion, ever succeeded in clearly reproducing the relation of the teeth to the physiognomy in a state of repose; that is to say, to the facial lines. For this purpose we can use the prosopometers, wherewith the distance from points of the teeth and facial lines to the ear is given, or L.

Ruppe's gnathometer, in which this idea is worked out most satisfactorily. By means of a complicated apparatus that is put on the head of the patient, the distances from different points of the facial lines and teeth (molars and incisors) to the ear are indicated, and, after the removal of the apparatus, projected on the median plane.

ANGLE'S VIEWS ON THE TRIMMING OF CASTS.

Angle differentiates on the plaster model an anatomical portion, consisting of teeth and gums, from an "art" portion to which a certain symmetrical form is given by trimming according to a method worked out for him by Dr. Martin Dewey. This method of trimming has an esthetic but no scientific basis. In my opinion Angle's contention is open to serious doubt, viz, that "It may be put down as quite a general rule that the degree of perfection of the models he makes is indicative of the knowledge, skill, and success of the orthodontist in the treatment of his patients." A collection of such well-trimmed models does certainly give an appearance of care taken by the orthodontist, but one cannot get a clear idea of the degree of knowledge, skill, and success in the treatment from the appearance of a collection of models in which a scientific foundation is lacking.

The reason why, according to Angle, this trimming is to be done, is as follows: "There is a principle governing the proportions of the trimmed portion of the model that is very simple and natural, and gives fine balance and artistic effect." The manner in which such a model is trimmed I suppose to be generally known.

When the model is finished in accordance with this method, the base and top should be parallel. With *what* they must run parallel, Angle does not explain. If one regards the illustrations of models in Angle's standard work, one sees that the top and base of the model are made parallel with the plane of occlusion, whether the case belongs to class I, II, or III (see left illustrations in Figs. 14 and 15.*)

NORTHCROFT'S VIEWS REGARDING THE TRIMMING OF CASTS.

In Bennett's great work one finds this clearly stated: "The casts should be trimmed so that the base of each is parallel to the plane of occlusion." One also finds data in relation hereto by Northcroft. He makes use of a tripod covered with rubber pads to avoid injuring the model; then he places the model with the teeth upside down on the tripod in such a way that only the two molars (or, in case the remaining teeth are not present, the two deciduous molars) and the central incisors touch the rubber pads; then, around the base of the model a line is drawn at a certain distance by means of a tracing-tool, and by means of a plane the base is trimmed along this line. Others place the lower model on a horizontal glass plate so that to the left and right one molar, and in front one incisor, touch the glass plate; then with a tracing-tool a line is drawn around the base of the lower model at a certain distance from the glass plate, and along this line the base is planed off. The lower model is now placed on its base, and the upper is set in exact occlusal relation on the lower model; then, with the tracing-tool, at a certain distance from the glass plate a line is drawn around the upper model, which is shaved off along this line. In this way the base and top run parallel with each other. It is clear that by all of these methods some points of the plane of occlusion indicate the direction of base and top of the model. The back of the model, according to Angle's method, must stand perpendicularly to the top and base. We do not find, however, any reference by Angle to the direction in which this rear plane must stand perpendicularly to the upper and lower plane.

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* [The figures referred to will be presented in their serial place in the next instalment of this paper; see our October issue.—ED.]

Northcroft says: "After the base is made smooth, the model is placed on a wooden board or plank, and the back trimmed at a right angle with the median line." Others cut this back plane perpendicularly to the top and base, but following a line that runs parallel to the distal surfaces of the last teeth in the arch (left and right) regardless that this plane stands perpendicularly to the median plane (see Fig. 17, left). The direction of the back plane is then indicated by the distal surfaces of the teeth, just as the occlusal plane indicates the direction of the upper and lower planes.

SHORTCOMINGS OF ANGLE'S METHOD OF MODEL TRIMMING.

The sides of the model, according to Angle, must again stand perpendicularly to the top and base of the model; here the direction is plainly given, viz, parallel to the line of occlusion as indicated by the first molar and the canine. If, however, we observe the outline of his figures of base and top of the model, then these appear to be symmetrical—that is to say, both sides form like angles with the back. This is only possible when the teeth are entirely symmetrical, but in most dentures, especially in cases of malocclusion, the lines of occlusion to right and left do not form like angles with the median line. It is impossible, if one follows Angle's rule, to obtain a symmetrical figure. If one trims the sides to left and right parallel to the line of occlusion, it is impossible to obtain a symmetrical figure. The line of occlusion of the teeth indicates, by Angle's method, the direction of the sides.

The front plane of the upper model consists of two equal planes that stand perpendicularly to the top of the model and meet at an angle, whether or not this angle comes between the two first incisors. Angle also says that, "Following this plan, any variation from the median line is shown."

The various planes of a model, trimmed in accordance with Angle's method, can never be used as a basis of judgment in respect to the deviations that present themselves in a set of teeth. Deviations in the line of the level of the teeth in the front and back part of the upper or lower jaws cannot be judged by the top and base of the model. Migrations of the teeth from left and right to mesial or distal in relation to each other, and in relation to a frontal plane of the skull, cannot be judged by the rear plane of the model. Migrations also in transverse direction in relation to the median line cannot be judged by the side planes. The angle of meeting of both front planes of the upper model cannot be looked on as a basis for judgment as regards migrations of the incisors in relation to the median line. if the back plane does not stand perpendicularly to the median plane, and yet the outline of the upper model is still a symmetrical figure. Thus the teeth can never be judged by the planes of the model, since it is the teeth themselves which indicate the direction of the planes. By my method, which will be described later, the model is so shaped that the planes form an exact basis for judgment in relation to the various deviations of the teeth.

The technique of imparting to the models a symmetrical form in accordance with Angle's method has been extensively worked out by various authors. For this purpose we have Angle's plaster plane, Grünberg's plaster plane, and a similar instrument introduced by Northcroft.

A model trimmed in the foregoing manner has a very good appearance, but it has no scientific value. Though it is true that we make our diagnosis for a great part by means of the plaster model. the first requirement is that the model should furnish a correct reproduction of the condition of the teeth as found in the case in hand. It will be clear to the specialist that the main question is not the relation of the teeth of the upper and lower arches to each other. but far more the relation of the teeth to the remaining part of the skull and the facial lines. The model trimmed ac-

cording to Angle's method very insufficiently reproduces the true condition as it exists in the patient's case. Only the orthodontist who has taken into consideration merely the relation of the teeth to each other can be satisfied with such a model. It is clear that such a model can be given any position; one can turn it around a vertical, a sagittal, and a frontal axis—numberless positions are possible, while the orthodontist cannot learn from the model what is the actual position of the teeth in the patient's mouth.

CRITIQUE OF ANGLE'S CLASSIFICATION.

If such a model be placed with its base resting on a horizontal glass plate, then any turning of the model around a frontal and sagittal axis is excluded; it is only possible to turn it around a vertical axis. The plane of occlusion which we are to judge is entirely governed by the direction of the base of the model. From this the great mistake of this method appears, namely, that this occlusal plane, from which we are to examine the deviations in direction, itself governs the direction of the basis for our judgment—that is, the top and base of the model. On the same faulty basis has Angle built his classification, in which the malocclusions are divided according to the relative positions of the first molars, into classes I, II, and III. Hereby also, points of the teeth—*i.e.* the first molars, which can themselves deviate in many ways from their normal position, are taken as a basis for judgment of deviations of position in the whole set. This classification is nothing but a diagnosis of relation of the first molars to each other in sagittal direction, and certainly not a diagnosis of an occlusal anomaly of the whole set of teeth. This has heretofore been all too little comprehended. Even in a facial plaster cast the same difficulties prevail as in the model; for neither can this facial cast be held in every position, which—for instance, in judging the degree of prognathism—is of great importance.

KÖRBITZ'S METHOD OF DIAGNOSING MALOCCLUSIONS.

After this critical review of the value of the plaster model trimmed in accordance with Angle's method, I shall now consider the method of examination used by Alfred Körbitz—namely, the comparison of symmetry whereby it is possible to show the migration of the teeth from left and right of the arch in a sagittal direction in relation to each other and in relation to a frontal plane of the skull. To him belongs the merit of having introduced in 1909 this method of diagnosing malocclusions. He founds his method on the following basis: Symmetry is one of the most reliable qualities of those organisms which possess symmetry, and everyone makes unconscious use thereof when he critically regards an upper jaw—as, for instance, in trimming the upper model. In order to judge a model of an upper jaw, Körbitz makes use of the raphe that divides the upper jaw into two equal parts, which can hereby serve as a basis of judgment of the teeth from left and right. This raphe he indicates with a pencil line on the upper model; it is a curved line arising through the intersection of the median plane of the skull with the palate. In the lower model we have not such an anatomical line of intersection of the median plane with the floor of the mouth; therefore such a line must be constructed.

In order to construct such a line he places the lower upon the upper model in correct occlusion, and then drops a weighted thread from above down on the back of the model from the median line of the upper model. When now this model is held in the hand and turned in such a way that the perpendicular line —looking from behind into the model —coincides with the line of the raphe, then the plane which passes through the thread and the median line of the upper model represents also, while the models are held horizontally, the plane that intersects the lower model in the middle. On the back of the lower model, where the thread crosses it, a mark is made,

and this point is joined with the foremost point of the median line of the upper model; this line of junction is the median line of the lower arch. This line will lie normally between the lower central incisors; if it meets an incisor on the lingual surface there is a migration of the incisors of the lower arch either to left or right. Then one constructs transverse lines on both models standing at right angles on the given median line and compares in that way the relative position of homologous teeth, left and right. In case both sides of the set of teeth are normal, homologous points of homologous teeth are touched by the same transverse line. If they do not, then the teeth have migrated from left or right toward the mesial or distal.

Körbitz points out that deviations of the entire arch or jaw are not demonstrable in this way. For that purpose it is necessary to have points external to the mouth that can be regarded as fixed —such as Angle assumes to possess in his "line of harmony," and Case in his "unchangeable area."

Now, when the model is turned so that the perpendicular line of the plummet is seen in line with the raphe, then it is certain, inasmuch as the raphe presents a curved line, that the model takes such a position in space that the median plane of the model stands perpendicular on the horizontal plane somewhere in space. One can thus (although Körbitz does not apply this practically) observe, by holding a model in this position, whether the level of the left and right sides of the model is the same, or whether they differ in height; in other words, one observes asymmetry of the arch with the alveolar process in a frontal plane in regard to a horizontal plane.

This asymmetry should be easily seen if the top of the model really represented the horizontal plane, but this is not the case with the present method of trimming. When revolution around a sagittal axis is excluded, when the raphe and the plummet cover each other, it is possible to turn the model around a frontal axis in all directions, as hereby the raphe and perpendicular line cover one another. Körbitz adds, in explanation of his method, "while the model is held horizontally." But how is that to be done when the model is held in the hand? Körbitz has trimmed the top of the model beforehand, as I understand it, in accordance with the method before described, *i.e.* parallel with the plane of occlusion. Only if the so-constructed top should accidentally stand perpendicular on the median plane of the model is it possible to hold this model, *i.e.* the top, horizontal while at the same time the perpendicular line and the raphe cover each other. If such a model is held horizontally, which requires a spirit-level, even then the condition is not reproduced as met with in the patient. While we are now able to judge the level of the teeth in a sagittal plane in relation to the horizontal plane (top of the model), it does not represent the patient's condition. In most cases, however, the top of the model indicated by the occlusal plane will not stand perpendicularly on the median plane, and it will not be possible to hold this upper plane horizontally while at the same time the perpendicular line and raphe cover each other. If in such a case the perpendicular line and raphe cover each other, then it will be seen that the upper plane does not run horizontally.

The top of the model should be made horizontal while the model is held in this position, and this should be possible at every turn of the model around a frontal axis, as hereby the perpendicular line and the raphe are in line. The direction of the top of the model can be constructed just as one desires. Whenever the model is set on the table it does not reproduce the position which the patient's teeth have, neither in the frontal nor in the sagittal plane, because the median plane does not now stand perpendicularly on the horizontal plane; while, if the model is moved freely in the hand so that the perpendicular line and the raphe are in line, the median plane will stand exactly perpendicular on the horizontal plane—and

in that position only can symmetry in the frontal plane in relation to the horizontal be judged.

After the line of intersection of the median plane with the upper model and the lower model has been indicated, the different transverse lines which are necessary for comparison of the symmetry must be constructed. For this, also, Körbitz has pointed out for us a simple way. He takes a small oblong piece of white cardboard and draws a perpendicular line on it so as to divide its surface lengthwise into two parts. In the middle of the card a circle is cut out so that the line (part of the said perpendicular line) forming the diameter of the circle drops out. When one now puts this card on the model and turns it so that the penciled median line on the model runs exactly in line with the remaining two parts of the perpendicular line on the card—which is observed through the circular hole in the card—then the longer side of the card will form a transverse line that stands perpendicularly on the median line. In that way one can move the card over the model and compare the various points to the left and right.

THE VALUE OF SYMMETROSCOPES.

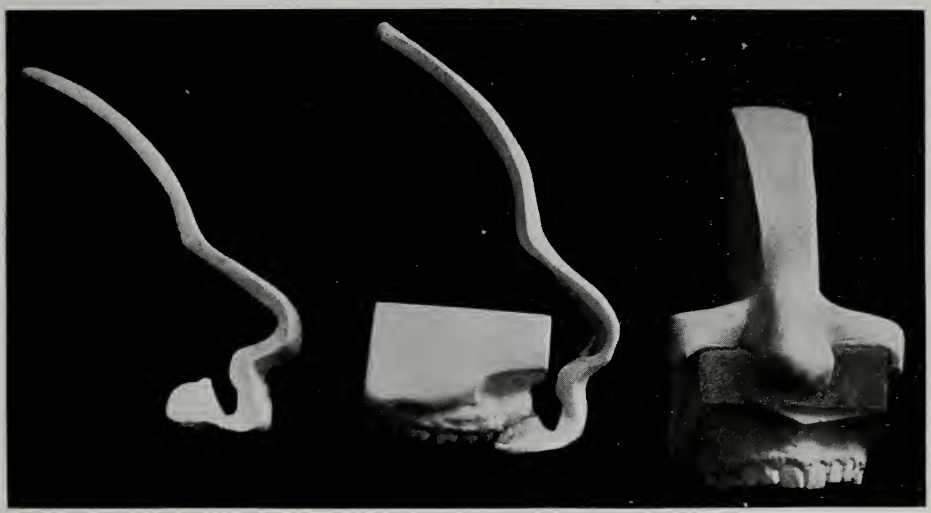
As Körbitz by this method intends only to find the median line of the lower model, his method is a very good one, but the tracing of the median line on the lower model is difficult to do, as it is a curved line. My remarks concerning the top of the model have been made solely in order to point out the importance of the top, and to make clear the difference between the method adopted by Körbitz and that followed with the symmetroscope. The more recently introduced instruments for indicating the median line and for making a comparison of symmetry have been all founded on the Körbitz method. Thus Zielinsky's orthometer, Grünberg's symmetroscope, Zawidzki's apparatus, and Sheldon Friel's symmetroscope. In all these symmetroscopes, the ground plane whereon the model with its upper plane is placed stands horizontally. Over this basal plane a thread is stretched that stands perpendicularly in the middle of the long side of the basal plane. With this thread, the dissecting line of the median plane with the upper model (raphe) and with the lower model must now be brought into line; then a movable thread, that stands perpendicularly on the first thread, reproduces the transverse lines for the comparison of symmetry.

The great difference between other symmetroscopes and that of Körbitz consists in that the model is not now freely held in space, but that with its top it rests on the horizontal basal plane of the symmetroscope, and thus revolution of the model around a vertical axis is possible, while it is not possible around a sagittal or frontal axis. As the raphe is a curved line, *i.e.* the line of intersection of the median plane with the palate, if the optic axis from the eye is fixed in the median plane of the symmetroscope, the thread of the symmetroscope can only come in line with the raphe if the top of the model stands perpendicularly on the median plane—thus in one position only. If, as we generally do, we place under the symmetroscope a model the top of which is determined by the plane of occlusion, then it is never possible, if the axis of the eye lies in the median plane of the symmetroscope, for the raphe to come in line with the thread. This coming into line can only occur if the optic axis lies in a plane that forms an oblique angle with the basal plane of the symmetroscope. The raphe of the model, as well as the observing eye, will be found beside the median thread of the symmetroscope. By the Körbitz method the median plane is found and placed vertically to the horizontal plane, so that deviations can be judged in the frontal plane in relation to the horizontal plane, but not the deviations in the sagittal plane. By means of the symmetroscopes the median plane is found, but is not placed vertically, so that hereby neither the deviations in the frontal nor in the sagittal plane, in respect to the hori-

zontal plane, can be told. The symmetroscopes, therefore, are inferior to the Körbitz method.

If one has so placed the model under the symmetroscope that the thread falls in line with the raphe, then one can discover, by moving the transverse thread, whether there are migrations of the teeth from left and right in a sagittal plane in relation to each other, or in relation to a frontal plane of the skull. This frontal plane can be the rear of the model, at least if this stands perpendicularly on the median plane in relation to the rear plane the degree of displacement in a sagittal plane can be read off. To read off the degree of displacement from left to right in a frontal plane in relation to the median line, the symmetroscope can only be made use of if the thread of the symmetroscope covers the raphe while the optic axis of the eye falls in the median plane of the symmetroscope; in other words, if the upper plane of the model stands perpendicularly on the median plane, one moves the third sort of thread attached to the symmetroscope, which forms a different angle with the median thread, and thus reads off the degree of the angle in which the threads to left and right from homologous points run off. By the present mode of construction of the top of the model, measurement with the symmetroscope is without value, inasmuch as the raphe of the model always lies beside the median thread of the symmetroscope. Grünberg, in his method of examination, does not first allow the median thread to run in a line with the raphe, but lays the thread between the first two incisors (these may often deviate from the median line) and lays two lines along the sides of the arch of the teeth at homologous points which go off at a tangent of like degree, and then judges the arch. This seems to me a very faulty method.

FIG. 1.



a *b* *c*

a, Impression of forehead, nose, upper lip, and labial surfaces of upper front teeth. *b*, Model of upper jaw fixed to the impression *a* in the right position. *c*, Cast of *b* with sheet of wax on the upper model.

THE WRITER'S METHOD.

Symmetroscopes have been invented in order to make a comparison of sym-

metry; that is, in order to trace the median line and to draw the transverse line. For this purpose they are very well suited. As exact instruments for measuring, however, they cannot be used. For this reason I have endeavored to construct a symmetroscope wherewith one might also exactly read off the degree of the various displacements of the teeth. After having pointed out the incompleteness of the methods of examination referred to, we will now describe a method that, according to my idea, will be in many respects more exact than those hitherto employed.

Fig. 2.

Impression of the face with cast of Fig. 1, *c*, in the right position.

In this method we have tried to attain the following aims: The model is to reproduce the deviations in all directions precisely as they appear in the patient; also, deviations in different patients can be compared with each other, so that all can be judged upon the same basis.

It is clear that as a basis of judgment, it is not points of the teeth themselves that must be determined, but external points. For this purpose the median plane serves together with its perpendicular frontal and horizontal plane. One can thus suppose each set of teeth to be put in a cube with horizontally placed basal plane, the set of teeth being so placed that the median plane of the upper model, of which the raphe is the dissecting line, runs parallel with the side planes of the cube. Deviations of the teeth and jaws can then be judged in relation to the planes of the cube. The cube is supposed to be placed not only around the teeth but also around the patient's head; the head can take any position in the cube, and, with the head, the teeth in occlusion. It is essential, if we wish to compare the various teeth of different patients, to give the head of each patient precisely the same position in the cube.

In this position of the head in relation to the planes of the cube, the teeth can be judged, and moreover we have always the same basis for judgment. To attain this it was necessary first to find a method by which to lay down the exact relations of the teeth to the facial lines and to reproduce in a plaster model the head as well as the teeth in this relation. Ruppe's gnathometer does certainly reproduce the relation of the teeth to the facial line, but this method seems to me less exact, because one has to put between the lips, and even between the teeth, a part or parts of the apparatus. A more exact method, according to my idea, is as follows: Take a plaster impression in the median line of the forehead, bridge of the nose, point of the nose, and middle part of the upper lip, and let the plaster run into the vestibulum oris, which must then be brought into contact with the plaster on the face, while the patient holds the teeth in occlusion. For this purpose the lips must be held apart. The impression thus obtained reproduces the forehead, bridge of the nose, upper lip (not in the position assumed in a state of repose), and the labial and incisal surfaces of the front teeth of the upper jaw (see Fig. 1, *a*). Hereby is obtained the relation of the upper teeth to the part of the facial line that can be judged as fixed, the forehead and the bridge of

the nose. Afterward, an impression in plaster is taken of the upper jaw, and the model is placed against the facial impression so that the front teeth of the upper jaw fit into their impression on the facial negative, and in this relation the upper model is fixed on the facial impression (see Fig. 1, *b*). The top of

FIG. 3.

FIG. 4.

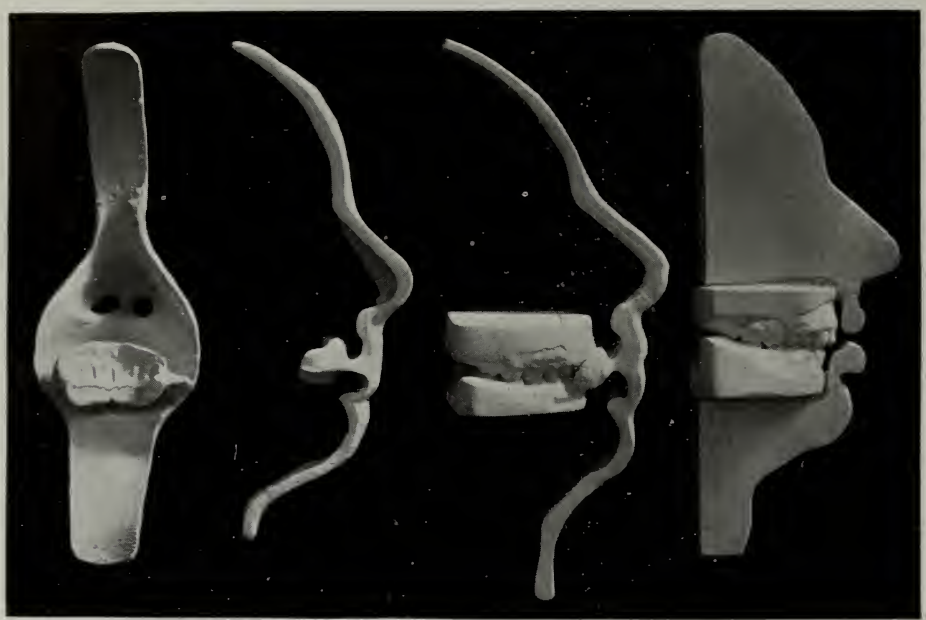
FIG. 3: Impression of the same face with German silver bar holding the piece of impression compound which indicates the right position of the upper model.

FIG. 4: Plaster facial cast made from the impression shown in Figs. 1, 2, and 3, with the model in the right position. Notice the places where the lip pressure is exerted against the teeth. The lower lip presses against the upper teeth. On the plaster facial cast the Frankfort horizontal line is drawn running from the tragion to the orbitale. On upper and lower model a line is drawn parallel with the Frankfort horizontal line. The top and base of the model are bladed off parallel with those lines (the writer's method). On the upper and lower model is drawn a second line parallel with the plane of occlusion, along which the top and base of the model are bladed off according to the method hitherto practiced. Notice the inclination of the teeth.

the upper model is then covered with a sheet of wax, and a positive cast of this facial impression is made. Thus a positive is obtained that shows clearly the position of the upper model in relation to the forehead and bridge of the nose (see Fig. 1, *c*). Against the palate of this positive, some impression compound is placed that fills up the palate, and in it is fixed a strong bar of German silver which runs transversely behind the upper model (see Fig. 4), or it can be so fixed that it first runs in the impression compound in the direction of the raphe, then comes into sight, and now may be bent toward the top (see Fig. 9). Then a plaster impression is taken of the face, *i.e.* of the physiognomy in a state of repose (see Fig. 2), and the upper model is placed with the positive of the forehead and the bridge of the nose fixed to it (see Fig. 1, *c*). The lips have been cut off, as they do not have the correct position in this negative of the face, in which it fits in one way only (see Fig. 2). Now we have the upper model in exact relation to the impression of the face.

Both extremities of the bar, if it stands transversely, or only one extremity if it stands sagittally, are fixed in the negative of the face, while the forehead and the bridge of the nose are placed in their correct position, and the impression compound is pressed against the palate. Thus the impression compound patient, with the impression compound in the middle (see Fig. 9), which gives us the position of the upper jaw, and where it fits exactly on the upper model. If we now fix the lower model with wax against the upper model in exact occlusion we have attained our object—we have reproduced the exact position of

Fig. 5.



a *b* *c* *d*

a, Impression of forehead, nose, upper and lower lip, chin, and labial surfaces of upper and lower front teeth; view from the inside. *b*, The same impression seen from the side. *c*, The model placed against the impression in the right position. *d*, Cast of *c*, which can be placed in the facial impression.

by means of the bar is fixed in the exact position in the negative of the face. The wax plate on the upper model is then softened, when the positive of the forehead and bridge of the nose is removed, and next the upper model—removing them together is impossible owing to the undercut (see Fig. 3). If a positive is now made of this negative, then the impression compound is fixed in this positive in the correct position, so that one has now the model of the head of the the teeth and alveolar process in relation to the facial lines (see Fig. 4).

The simplest method for reproducing the relation of the teeth to the facial lines consists in taking the impression referred to of the forehead, nose, lip, and labial surface of the upper teeth. Also an impression may be taken of the entire facial line; thus, the middle of the forehead, nose, both lips (not in exact position), and the chin, to which the impression of the labial surfaces of the

upper and lower incisors is joined (see Fig. 5, *a*, *b*). If the teeth in occlusion be placed against this impression (see Fig. 5, *c*), the position thereof gives us a section of the head in the median line with the teeth in correct position (see Fig. 5, *d*), and this positive can now, after cutting away the lips, which are unreliable as regards their position, be brought to the exact position in the impression of the face. Fig. 4 represents the positive of the impression shown in Figs. 1, 2, and 3. It is a reproduction of the face of a patient with the teeth in correct position in relation to the facial lines. This again illustrates an important point very clearly, viz, the position of the dividing line of the closed lips in relation to the teeth and the places where the lip pressure is exerted against the teeth. In this pathological case the pressure of the lower lip is even exerted on the alveolar process of the upper jaw. In order to make this clear I have cut away a part of the facial plaster cast. In the facial cast in Fig. 7 one sees, contrariwise, that the lower lip leaves the upper teeth entirely free. Through this method we obtain a much better idea of the lip pressure in different patients than hitherto has been possible.

(To be continued.)

CONSTITUTIONAL INFECTION DUE TO CHRONIC DENTO-ALVEOLAR ABSCESS AND PYORRHEA ALVEOLARIS.

By L. W. DOXTATER, D.D.S., New York, N. Y.

IT is important for the dental practitioner to recognize the constitutional diseases due to local infections in the oral cavity.

It is only recently that we have begun to appreciate how common is the contamination of the blood by living organisms. For some time only the more serious conditions of septicemia and pyemia were recognized as being caused by living bacteria in the blood, whereas this fluid may contain many living bacteria that may be a source of disease, such as streptococci, staphylococci, and various bacilli.

ORAL INFECTION AS THE CAUSE OF SYSTEMIC DISEASE.

The leading physicians of the country today first look to the oral cavity for infections that may be the causative factors in systemic diseases. Murphy states that every type of non-traumatic inflammation of the joint is the metastatic manifestation of a primary infection in some other part of the body.

Dentists are becoming cognizant of the fact that a large percentage of infectious arthritic conditions is due to pyorrhea alveolaris. Pyorrhea accounts for an enormous amount of blood infection; 75 per cent. of these cases can be healed by treatment, and most of the others can be held in check by continued treatment. In some cases, removal of the teeth is necessary to accomplish a cure. Removing teeth that are hopelessly infected prevents the harboring of certain bacteria.

The nasal cavity has its special group of bacterial flora, but the great majority of pyogenic micro-organisms affecting the body must enter through the mouth.

In the mouth the teeth are subject to infective destruction from many causes, but by far the most destructive are root abscesses that are developed from dis-

eased pulps of teeth. Very frequently these abscesses are not suspected until their presence is revealed by the X-ray.

PRACTICAL CASES.

The following are a few cases from my private practice:

Case I. Mr. B., thirty-seven years. The patient had been suffering from severe pains

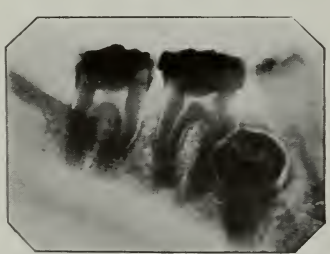
FIG. 1.

on the right side of the face and rheumatic pains in the right shoulder; had been treated by three specialists without result. He then consulted Dr. Thomas H. Russell, who referred the case to me.

The radiograph revealed an abscessed upper right canine with perforated root, and a perforated lower right first molar with putrescent root-canals. (See Figs. 1 and 2.) Both roots were extracted, and the patient has had no trouble since.

Case II. Miss S., twenty-eight years. The patient had been suffering from periodic pains

FIG. 3.



in the lower jaw, at times excruciating, and had been treated for neuralgia without any benefit whatever. The case was then referred to me. The lower jaw was radiographed and revealed an impacted bicuspid. (See Fig. 3.) The tooth was removed, and the patient experienced no further trouble.

Case III. Mr. B., fifty-eight years. The patient presented a very severe case of pyorrhea alveolaris arthritis, with fingers and elbow-joints badly swollen. His breath was fetid, the teeth were loose, and discharging pus; there was also slight fever. The teeth were cleaned, and all pus pockets cleansed by pressure and irrigation with solution of echinacea, followed by a saline solution. The gums were

FIG. 2.

then painted with tincture of iodin. These measures were adopted to eliminate as fully as possible all pus exudate; then, by means of a blunt-pointed hypodermic syringe, a few drops of a one per cent. solution of emetin hydrochlorid were forced into the pus pockets, and their margins anointed with vaselin to retain the solution in contact with the pocket walls as long as possible. This treatment was repeated every other day until all pus flow and inflammation subsided, when thorough instrumentation for the removal of deposits from the root surfaces was instituted. At the end of the fifth week, the systemic conditions had entirely disappeared.

Case IV. Mr. B., sixty-four years. In 1859 the patient cut the anterior chamber of the right eye with the point of a knife. The fluid ran out, producing total blindness in that eye. At first the organ gave the patient no trouble, but by 1878 it had become inflamed, with calcarious formation at the back, and was removed.

The left eye was somewhat affected before the operation, but in a few weeks regained its strength, and gave no further trouble. In 1896 the upper left canine was cut off and a Richmond crown inserted, to which was attached a substitute for the adjoining incisor, which had been extracted some time before.

About 1901 the left eye became subject to aches of a few hours' duration, and began to feel weak, with the pain recurring more

frequently and remaining longer, accompanied with an overflow of tears. The patient then consulted an oculist, who found conjunctivitis on the lower lid with a trace on the upper one. As time passed, the symptoms became aggravated. Treatments were continued by the oculist at intervals until 1907. The redness on the lower lid persisted, although every remedy known to the profession had been applied, and it was deemed best to discontinue the treatment.

A few years later the patient consulted another oculist, but obtained no relief. He found nothing except the conjunctivitis, which he was sure could not produce the trouble.

FIG. 4.

In 1914 the slight pain and overflow were present about one-third of the time, at irregular intervals, and gave the patient great discomfort and considerable anxiety. He again consulted the second oculist, who found the duct open and the ball of the eye normal. In his opinion the conjunctivitis was too slight to cause the trouble complained of.

The patient then consulted me as to the possible effect upon the eye of the crowned canine, which for several years had given evidence of slight irregularity, though not of a character to be called pain. The radiograph revealed a blind abscess at the root of the canine. (See Fig. 4.) The end of the root was amputated, but the affection of the bone was too great for recovery, so the tooth was extracted.

This operation was performed in January 1915. Gradually the troublesome conditions disappeared, and from January until now the patient has had his first enjoyment of life in many years.

Case V. Mrs. G., forty-one years. The patient, whose mouth was in very bad condition, had been confined to bed because of swelling in her knee-joints. I diagnosed the case as pyorrhea alveolaris arthritis. Several teeth were extracted, and the gums and remaining teeth were treated. At the end of ten days the patient was very much improved, and at the end of the third week all the inflammation left the joints, and the patient seemed to be in the best of health.

Case VI. Mrs. M., thirty-six years. When the patient came under my observation, she presented a very severe case of pyorrhea alveolaris arthritis. Her fingers, knees, and elbow-joints were involved. Raising the forearm above the head caused severe pain. An examination of the oral cavity showed several ill-fitting crowns and two ill-fitting bridges. The bridges and crowns were removed, and most of the teeth responded to treatment, but it was necessary to extract two lower molars. The pyorrhea was arrested, the teeth tightened firmly, and new bridge work inserted, and the systemic conditions cleared up.*

Dr. C. H. Mayo, in a recent article, made the following statement: "It falls upon the dentist and oral surgeon to study the disease conditions of the mouth. Dental literature is full of it, and much original work has been done by such leaders as Black, Talbot, Nodine, Hartzell, Brophy, and numerous others. The work is discouraging, but must be kept up, as eventually it will have its effect. The dentist's patients must be warned of the mouth as being by far the greatest portal of entrance of germ life into the body, the most infected part of the alimentary canal. The people will gradually demand more of their medical advisers. The next great step in medical progress in the line of preventive medicine should be made by the dentist."

* All extractions, root amputations, and work of a surgical nature were performed by Dr. Frederick K. Ream.

PREVENTION—THE TECHNIQUE OF THE FUTURE.

By Dr. C. H. GERRISH, Exeter, N. H.

(Read before the Connecticut State Dental Association at its annual meeting, Hartford, Conn., April 20, 1915.)

SOME fifty years ago a patient of Dr. Riggs' came to me for treatment of pyorrhea, asking me to treat her mouth and teeth on the same lines as pursued by Dr. Riggs. It was a revelation to me what a *clean* root, a polished root, meant! This inspired me to extend the cleansing process to the crowns of the teeth, reasoning that if pyorrhea was checked or cured thereby, why might not also caries of the teeth be stopped or prevented in that manner? Hence, upon the theory that a polished tooth might be immune from decay, I began what has proved to be my life-work—meeting with much opposition and the superstition that touching the enamel of the teeth meant decay and destruction. No precedent had I to go by, as the polishing of teeth was then an unknown field of dental art.

Having started with the use of the orangewood stick and pumice-stone, Arkansas pencil, linen tape, quill picks, thin linen tape, and waxed floss silk, all by hand, I am using at the present time the Arkansas stones, rubber disks, brush-wheels, etc., in the dental engine; and the results have been marvelous. My theory was sound and correct, as the vital facts now show; in some of my oldest patients I have not been obliged to make a single filling in an average of twenty years; others have been immune for over twenty-five years.

CLINICAL RESULTS OF IMMUNITY TO CARIES.

My position regarding the matter is simply this: Either this technique is valuable, or a delusion, or I am an impostor. There is no middle ground for me to fall back upon—and I desire none. My credentials are my patients, and open to your inspection. To quote from a letter of Dr. Rogers and Dr. Libby of Boston, who examined the teeth of one of my patients: "We should judge by the splendid condition of her teeth, especially at the gingival line, and the general condition of her gums, that she is safe for another twenty-five years." This patient has not a single filling anterior to the molars upper or lower. Were this an isolated case, one could ascribe it to heredity, but what about another patient who has had every tooth filled, yet has been immune from recurrent caries for twenty years? These results have been obtained in patients who have been in my care from childhood, and who have followed my directions to the letter. Can these results be obtained in all cases? No; degenerates and those deficient in their heritage are exceptions, but in every one of even these cases the treatment will produce a delay in the decay, and prolong the life and use of the teeth.

THE WRITER'S TECHNIQUE.

What is the technique? It begins with the mother, then with the child's temporary teeth, and as soon as the permanent teeth erupt and polishing is continued with stones none of which are of coarser grit than the Arkansas stones, and refined silex. (See illustration.) The time required for treatment ranges from an hour or two in children to four

or five hours in the grown-up. As for frequency, the treatment is given from one to four times a year.

As the result of this polishing, we secure a smooth enamel surface; the lines of imbrication are worn down in time, from five to ten years being required to secure this result. Too deep cutting or polishing is fatal, as is the use of coarse stones. The final finish is obtained with a mixture of prepared chalk and oxid of tin in the proportion of three to one, which leaves the enamel surface as smooth as a diamond.

THE PATIENT'S PART.

The patient's part consists, in the morning, in brushing the teeth, giving them a so-called "dry brush"—that is, the brush is just moistened, covered with powder, and used with a rotating movement, until the gelatinous plaques are removed. *Paste will not do this,* or, to be less emphatic, not for *my* patients, because they have tried it. At night a dental cream can be used to great advantage, the last step consisting in the use of waxed floss.

EFFECT OF TREATMENT.

What change, if any, takes place in the enamel structure under this intensive polishing, continued for fifty years, I do not know; I can only voice my conviction—and, not being a scientific man, my views may be guesswork. Apparently, the effect is stimulating, and I think the enamel undergoes a change, though the authorities are against me. However that may be, I get the same results that seem evident in erosion, namely, immunity from decay without the waste of tooth material.

GUTTA-PERCHA FILLINGS.

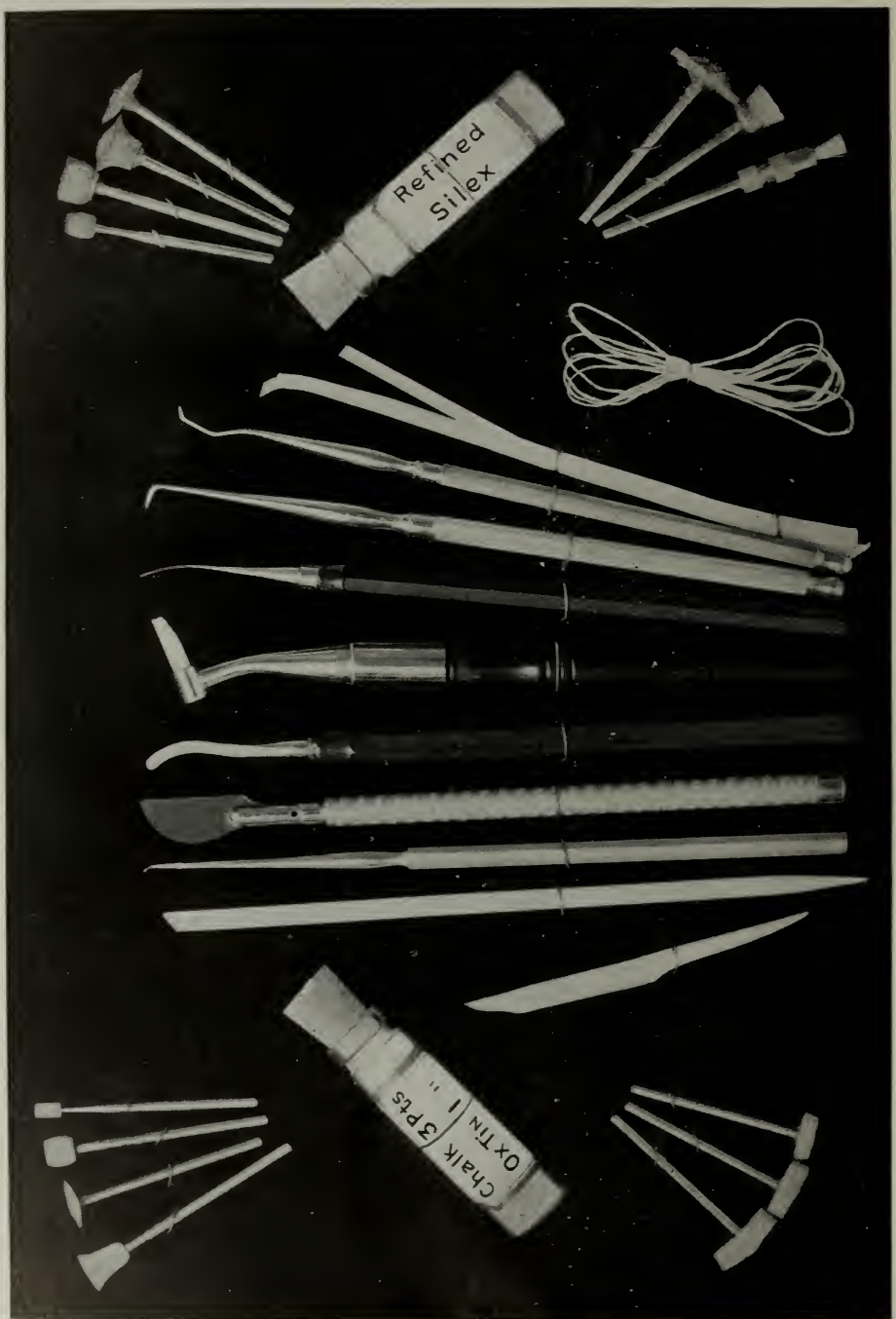
The filling that saves a tooth from further decay must be a perfect stopping. All stoppings are fillings, but all fillings are not stoppings. Gutta-percha is the ideal stopping, especially red base-plate gutta-percha, because it contains a germicide and it adapts itself to the cavity; besides, it is forever swelling. It swells, and it also smells, and when properly used is quite permanent in its results. I recently refilled a tooth which had been kept perfect for twenty-three years by a gutta-percha stopping except for the wearing away of the filling. Non-cohesive gold, among the many forms of gold, possesses the same characteristics, and I am today watching fillings which were inserted over fifty years ago, and which preserve the teeth and look as well, save for a little wear, as when they were introduced.

ACCESSORIES.

Among the aids that I have found to be of benefit are the Indexo brush, which is a rubber cap with raised papillæ used on the forefinger to produce general massage of the teeth and gums. Should there be an inflamed condition, a saline solution, as suggested by Dr. Libby, is very efficacious in bringing about a normal state. I also recommend the daily use of Johnson's "Educators," a hard-baked whole-wheat cracker which not only furnishes the materials of tooth structure, but tends to the formation of a perfect arch, as it requires much force to masticate. In cases of extreme sensitiveness of the tooth structure at the gingival margins, I have found Phillips' milk of magnesia a specific; it has also proved very efficacious in the prevention of decay.

INCIPIENT CARIES AND PYORRHEA PREVENTION.

Incipient caries, especially at the gingival margins, I treat on similar lines, viz, with the use of Arkansas stones by the method above described, leaving the formerly carious portion thoroughly polished, and establishing immunity for one year. If this method is followed up, with the co-operation of the patient, this immunity can be prolonged to ten and twenty years. Other results follow this mechanical smoothness of the tooth structure. Pyorrhea is unknown: I


Refined
Silex
Chalk 3 Pts
Ox Tin 1 "

have never had a case among patients who have been subjected to this ideal treatment.

A PLEA FOR PREVENTION.

As a profession we have accomplished wonderful results in the treatment of diseases and in artistic fillings, and crown and bridge work. Yes!—fillings that do not stop decay, crowns that do not fit, bridges that smell to heaven! With the coming of the Forsyth Infirmary and the Evans Institute, two of the grandest blessings to mankind, let the lessons of prevention take rank with, or rather precede, all other teachings. May the profession, which is doing such grand preparatory work for the student and sending him out to battle with disease and decay, take this word from one who has devoted his life to prevention, and who is obliged, but who is also glad, to stand at the chair after fifty years of service. May they teach the students that the best filling is *no* filling. To save *from* is far better than to save *by*. For the time is coming, and coming rapidly, when prevention, the grandest word in the English language, will and must prevail in dentistry, medicine, law, religion, and national life. The temple is nearly completed, but one stone is lacking to restore the arch, the keystone, the stone rejected of you builders, on the face of which will be written "Prevention."

In conclusion let me quote from Dr. Bloodgood of Baltimore—who, in his closing remarks before the National Dental Association, said: "The great majority of dentists prefer to do the more expert mechanical work, bridge work and other things that require great skill. *They don't like to clean the teeth.* (Italics mine.) The day is coming when more people's lives will be saved by keeping the people's teeth clean than by doing bridge work! Again, how many cases of Bright's disease, that shortens the lives of many great men and women, have their portal of entrance through the teeth? So this thing you dislike to do, cleaning the teeth, may be the most important and expert thing you can do. I believe it is an expert thing."

If I can induce any of the younger practitioners to take up this work of prevention, it will gladden my heart. I trust you will pardon me if, in conclusion, I read you my creed: "If cleanliness is next to godliness, or goodness, then begin and end the day with a prayer, followed by a thorough cleansing of the mouth and teeth, thus rendering yourself immune from deceit and decay, the devil and disease;—for a clean soul and a clean mouth are much to be desired."

CONCERNING THE PRODUCTION OF DENTAL CARIES.

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(Read before the Dental Society of the State of New York, at its annual meeting, at Albany, May 13, 1915.)

OF all the subjects which constitute that branch of the healing art which is generally designated by the title of dental surgery, none has occupied the attention, time, and investigations of men more than that of dental caries. The reason is obvious. Daily confronted with the ravages of this common dental affection, they naturally endeavored, from the days of Leewenhoeck, to ascertain as much of the abnormal changes going on in the oral cavity as they possibly could.

Yet, in spite of all the writings of some of the ablest men of the dental profession, our knowledge is today still very incomplete. Historically the question is of great interest—not so much from the mistakes made, the false doctrines promulgated, the erroneous hypotheses suggested, the ludicrous statements formulated, as from the amount of truth discovered in the struggle for the clarification of the dim uncertainties of the problem.

Fortunately the treatment—mechanical and still largely empirical—was a simple problem, and soon solved, with regard to its general principles; but from the viewpoint of its causation, who can deliver an *ex cathedra* announcement which will be accepted as a certain verity by all classes of the medical and dental communities of the world? The fact is, as I have frequently insisted elsewhere, we do not know.

Why is this? It would seem that although a great deal of knowledge is forthcoming, although much digging in the ground for the nuggets of truth has been accomplished in the clinic, the laboratory, and the study, many diversities of conflicting thought exist, and it is as yet impossible to answer the question as to the nature of the etiology of the condition.

One need not again remind one's hearers that dental caries is not a disease, but a morbid condition; not a disease, because no one has succeeded in producing the signs and altered states of the tissues, either in the mouth of man or of the lower animals. Attempts in this direction have failed. Experimentally it is apparently perfectly easy to induce *in vitro,* by laboratory means, practically the whole of the morbid appearances connected with it. But the phenomena associated with it are totally dissimilar from those of caries of bone, and properly speaking are of such a nature as to preclude the possibility of ever placing it side by side with, and in the published category or classification of, any known disease.

Nevertheless, the word "caries" does occur in official documents. For instance, in "The Nomenclature of Diseases," drawn up by a Joint Committee appointed by the Royal College of Physicians of London, and issued as a fourth edition in 1906, one finds the word appearing under the heading of *Apparatus peptici morbi,* and in the subdivision entitled *Dentinae, cementi, et adamantis morbi.* But it should not really occupy that place; and its juxtaposition to a changed condition of the cementum which is called "necrosis (of cement)" reveals that the authors of that official

volume are still at a loss as to its significance. Even if one considers its meaning both literally and specifically, it at least should be bracketed, and a footnote explanatory of the affection appended. Its inclusion in that list is as incorrect as the suggestion that a tissue like cementum could ever possibly become necrosed.

My personal views have been frequently published, and are well known in certain sections of the dental world; but with the larger sphere of dissemination which this present meeting affords, the problem may well and profitably be reconsidered and re-discussed.

I do not propose to offer today a hypercriticism on various theories; I desire to narrate shortly what seems to me to be the only possible position to assume in regard to this matter, and to detail some steps to achieve the same.

In the past the subject has been dealt with chiefly by the bacteriologists, of whom Miller was the bright particular star. The clinician, the chemist, the physiologist have also been pressed into service, and have each *in suo modo* added to our knowledge. It is important, however, that the anatomist too be consulted.

ENVIRONMENT.

Dental caries must of necessity have its origin in the environment of the teeth. Strictly speaking, the meaning of the word "environment" includes a study of the nature and functions of the oral secretions and of the oral flora. But more than that: it includes a thorough understanding of the rapidly repeated variations these normally undergo in the presence of foods, be they solid or liquid, cooked or raw, and in the presence of other vicarious extraneous substances, be they medicinal or mechanical, persistent or transitory, innocuous or harmful. And further, and perhaps more important still, it includes the very complex investigations of the variations set up in these functions and in these actions as a part of general metabolic disturbances and diseases.

SUGGESTED CAUSES.

It is quite easy to mention the supposed, text-book causes of caries. The causes to which it is attributed may be conveniently classified in two great groups:

(A) *General predisposing causes:* 1 Civilization. 2. Heredity. 3. Improper dietary.

(B) *Local predisposing causes:* 1. Defects in tooth structure. 2. Irregularities in position of the teeth. 3. Vitiated oral secretions, the direct result of —(i) Occupation. (ii) Systemic diseases such as gout, rheumatism. (iii) Pregnancy.

The exciting causes are described as being a carbohydrate fermentation in so-called "stagnation areas," due to the lodgment of soft, starchy, sticky, and sugary foods, which become changed to a weak acid.

In other words it is believed that the bacteria of the mouth, accumulating on the surface of the teeth, reduce carbohydrate foods to sugar, and change it to lactic acid; as a corollary to this it is further assumed that in the treatment of the affection it is necessary to destroy these micro-organisms or to inhibit their action by suitable means.

SOME CRITICISMS.

It would be no difficult task to criticize adversely all the arguments advanced by those who hold these cast-iron opinions. For instance, with regard to heredity alone, one may safely say that it has very little, if any, influence in the production of dental caries. One can apply to this general belief in the transmission of physical and psychical parental attributes numerous examples of the influence of environment as apart from heredity. A musical child of musical parents is considered by many to have inherited a musical instinct—call it what you will. But all children of musical parentage are not themselves musical. It is the artistic environment which surrounds receptive conditions from

early childhood. The same argument also can be applied to the so-called inherited mathematical instinct. It is the result of environment—and so is dental caries. Parents possessing normal dentitions beget children with dentitions free from defects, and see to it that their dental environment is similar to their own. One child in the family of such parents may have rampant acute caries. This is probably due to the fact that a change has been induced by illness or debility of the patient or lack of hygienic habits in the environment of the teeth, objected to and discouraged by parental solicitude without avail. Those cases scattered through the pages of dental literature of clear, successive, anatomical deviations from the normal may be classified as "sports," and are not really examples of heredity.

The influence of civilization has often been advanced as a cause of dental caries. It is extremely probable that this opinion will have to be modified. Pickerill, in "The Prevention of Dental Caries and Oral Sepsis," notes that among the relatively immune races of mankind the Kaffirs possess 14.2 per cent., the Bushmen 20.6 per cent., the Australian aborigines 20.5 per cent., and the Tasmanian aborigines as much as 27.0 per cent. of caries. Surely these people can be considered as hardly coming under the control of what is generally meant by civilization.

FACTS.

Two things are absolutely certain. Dental caries is characterized by a partial destruction of Nasmyth's membrane and by a breach of surface of the enamel, with subsequent loss of the latter tissue; and secondly, it is a condition most commonly confined to childhood and adolescence.

SUGGESTED LINES OF THOUGHT.

The lines upon which the investigator of the problem must work are these: He must in his laboratory methods approach closely to the natural conditions which obtain in the mouths of ordinary individuals.

In deciding the invisible operations of saliva on the causation of caries, he must estimate more than its mere digestive action—the conversion of starch into maltose and dextrin through the erythro- and achroo-dextrins. He must ascertain the variations it undergoes as a result of disease or certain physiological disturbances. He must include in his researches the inhibiting action of certain substances, the varying dilutions through which it daily passes during the eating of manifold varieties of dietetic articles. Similarly the bacteriologist must determine by actual experiment the new conditions which arise, for identical reasons. Both the physiologist, the chemist, and the bacteriologist must also not fail to remember the nature, condition, and functions of enamel and its protective covering, Nasmyth's membrane.

The arguments of these various seekers after truth must be co-related, and, leavened with common sense and experience, applied to the study of the causation of this affection, and our knowledge will then, and not till then, be greatly benefited thereby.

ORIGINAL OBSERVATIONS.

Actuated by these thoughts, I have during the past few years devoted considerable attention to this aspect of the question, and I would urge my hearers when thinking over the matter to adopt the same viewpoint. Apology is not needed to re-state before a large audience such as this some of the conclusions to which I have come—conclusions which I trust time will prove to be correct.

Leaving aside the purely hypothetical arguments, a summary of my observations shows several interesting and I think important deductions. In the first place, when dealing with the behavior of caries-producing bacteria in the presence of certain common dietetic substances, it has been ascertained that pepper, fruit juices, starch, and candies—

except those containing a proportion of flavoring element such as vegetable or inorganic acid, and especially those of a sticky character—are bacteriophile, while mustard, vinegar, coffee, acidulated candies, glucose, and perhaps cane sugar, are bacteriophobe.

Secondly, it is equally clear and probably correct that the enamel cuticle when intact is a potent factor in the prevention of the attacks of dental caries, and also that penetration of bacteria masses beneath its abraded edges determine the *loci principii* of the affection.

Thirdly, it is highly important to note that the use of candies in the mouth may lead to dental destruction by mechanical, chemical, and bacteriological means. Of the former, many hard species of candies actually crack and break off enamel and dentin, on account of their intense hardness. "Sugar almonds" and "hardbake" are of this type. But far more harm is wrought by chemical and bacteriological means—one, perhaps, by perverting the nature of the oral secretions, and the other by encouraging the growth and development of caries-producing bacteria within the confines of the oral cavity.

It is necessary to determine whether and in what ways the oral secretions are altered in their nature, chemical reactions, and amounts by the use of candies, to compute the reactionary variations between the salivas of immunized and non-immunized persons, and to determine whether typical candies placed on interstitial surfaces in artificially prepared cavities, and on the free surface of human teeth, produce caries of the enamel or dentin.

It was first extremely important to ascertain whether saliva is rendered more acid by the presence of sugar in the mouth, or not—that is, assuming that an acid reaction of the saliva is harmful for the enamel.

For this purpose the disaccharids and the monosaccharids were tested under similar conditions, both in salivas from a mouth apparently free from active caries and from one in which caries was actively going on. The experiments, carried out *in vitro,* will be detailed fairly fully in order to allow them to be repeated by others, and to satisfy or otherwise the critics and chemical, physiological, and bacteriological experts.

METHODS.

The methods adopted were chiefly devoted to computing the extent of acidity or alkalinity of mixed saliva in mouths in which caries was absent, and also in those in which it was present. These are designated types I and II, the former being collected in known quantities from the mouth of an adult male of forty-three years, after thorough oral ablutions with warm water, and the latter from the mouth of a female of twenty who was not immune to dental caries.

It was found that both types varied in their chemical reactions; before noon perhaps acid, afterward alkaline, as the case might be. Thus on July 1st, at 10 A.M., 2.5 cc. type I saliva showed 1.6 cc. of acidity, and at 2.30 P.M. on the same day 2.5 cc. of fresh saliva of type I became chemically changed, and showed 1.4 cc. of alkalinity. Cases frequently exist where the saliva is synchronously acid on one side of the mouth and alkaline on the other. This would seem to be dependent upon the ebb and flow of the acid or alkaline "tide," the cause of which, however, at the present time is not satisfactorily determined. The salivas were collected in closed beakers and treated at once. Alkaline saliva will, if left in a jar exposed to the air, become foul-smelling; acid saliva appears to become altered in a different way.

The operation for acidimetry. Into a graduated vessel was poured 2.5 cc. of saliva, this amount being invariably used as convenient, on account of the fact that it can be collected successfully every ten minutes.

In performing a titration N/40 NaOH was used, with freshly prepared phenol-phthalein as the indicator, the proportions being—

Sodium hydroxid, 1.0 gm.
Phenol-phthalein, 0.25 "
Distilled water, 1000 cc. (1 liter).

Under a Mohr's buret containing this rosy-red solution was placed a small white dish which had previously received 2.5 cc. of the saliva to be tested. The solution was allowed to run into the dish drop by drop (each drop representing about 0.1 cc.), and thoroughly stirred with a glass rod. The end point of the reaction was reached when all the coloration had been discharged.

The test for alkalinity was performed by means of a modification of the Lowry-Zuntz method as employed for blood alkalinity, and consisted in using N/75 tartaric acid—that is, 1 gram of tartaric acid in 1 liter of distilled water. The alkaline saliva (2.5 cc.) having been placed in a receiver, the tartaric acid solution at 15° C. was added drop by drop, until a drop allowed to fall on neutral litmus paper from the end of a glass rod or stirrer had lost its blue color and had become decolorized. It was quite unimportant to ascertain the acid or alkali content by any quantitative reckonings.

List of Experiments.

Series A (Chart II).

Alkaline saliva, type I; *saccharose.*

The details of the simplest of all experiments can be recorded as follows:

2.5 cc. at a certain hour required 2.5 cc. of N/75 $(CHOHCOOH)_2$ to neutralize it; 7 gm. of cane sugar (table "loaf" sugar) were dissolved in the mouth, and 14 cc. saliva collected immediately. The saliva became slightly more alkaline, as it then required 3.0 cc. tartaric acid solution to neutralize it. It remained thus for ten minutes, when it required 2 cc.

Series B (Chart I).

Alkaline saliva, type I; *glucose.*

(1) 2.5 cc. required 2.25 cc. N/75 $(CHOHCOOH)_2$ to neutralize it before incubation. At the end of forty-two hours it required 3.5 cc. of N/40 NaOH. (See B, Chart I.)

(2) 2.5 cc. + 0.5 gm. glucose required 7.5 cc. of N/40 NaOH to neutralize it after incubation. (See D, Chart I.)

Nature: Thick, viscous, opalescent; much mucin.

Alkaline saliva, type II.

(1) 2.5 cc. required 2.1 cc. N/75 $(CHOHCOOH)_2$ to neutralize it before incubation; at the end of forty-two hours it required 2.1 cc. of N/40 NaOH. (See A, Chart I.)

(2) 2.5 cc. + 0.5 gm. glucose required 5.75 cc. N/40 NaOH to neutralize it after incubation. (See C, Chart I.)

Nature: Thin, watery, non-viscous; few flakes of mucin.

This shows that if alkaline saliva be put in the biological incubator it becomes acid in reaction in less than eighteen hours; that if it be mixed with glucose it becomes more acid than if unmixed, and that saliva from an immune becomes in these circumstances more acid than when caries-producing bacteria are present in the mouth. The presence of this sugar is, therefore, unnecessary to render an alkaline saliva acid.

Series C (Chart I).

Glucose.

Five test tubes washed with distilled water were used for the following:

A contained 0.010 gm. carious dentin + 0.25 gm. of glucose + 2.5 cc. water.

B contained 0.010 gm. carious dentin + 5 cc. of alkaline [2 cc. N/75 $(CHOHCOOH)_2$] saliva, type I, + 0.25 gm. glucose + 2.5 cc. water.

C contained 0.010 gm. carious dentin + 5 cc. alkaline saliva (as in B).

D contained 0.050 gm. carious dentin + 5 cc. alkaline saliva (as in B).

E contained 0.100 gm. carious dentin + 5 cc. alkaline saliva (as in B).

All tubes were placed in the incubator on July 5th, at 7.30 P.M., and examined on July 9th, at 12 noon—that is, ninety hours after incubation. (See Chart I.) The results showed that, to neutralize—

2.5 cc. of A req. 1.75 cc. NaOH.
2.5 cc. of B " 12.75 cc.
2.5 cc. of C " 2.5 cc. $(CHOHCOOH)_2$.
2.5 cc. of D " 1.5 cc. $(CHOHCOOH)_2$.
2.5 cc. of E " 1.5 cc. $(CHOHCOOH)_2$.

These experiments showed that sugar solution, in itself neutral in reaction, becomes acid in the presence of caries-producing micro-organisms; that in the same circumstances, if alkaline saliva be added, it becomes enormously acid; that the alkalinity of saliva is practically unaffected by the presence of

caries-producing micro-organisms; and that a few bacteria are as potent in the mouth as many.

SERIES D (CHART II).

(a) *Acid drops* (druggists').

Saliva, type I, collected during hours of fasting between 10 and 1 o'clock, after brushing the teeth and rinsing the mouth with warm water. Type I, tested: 2.5 cc. were found to be acid, and were neutralized by 0.9 cc. N/40 NaOH solution.

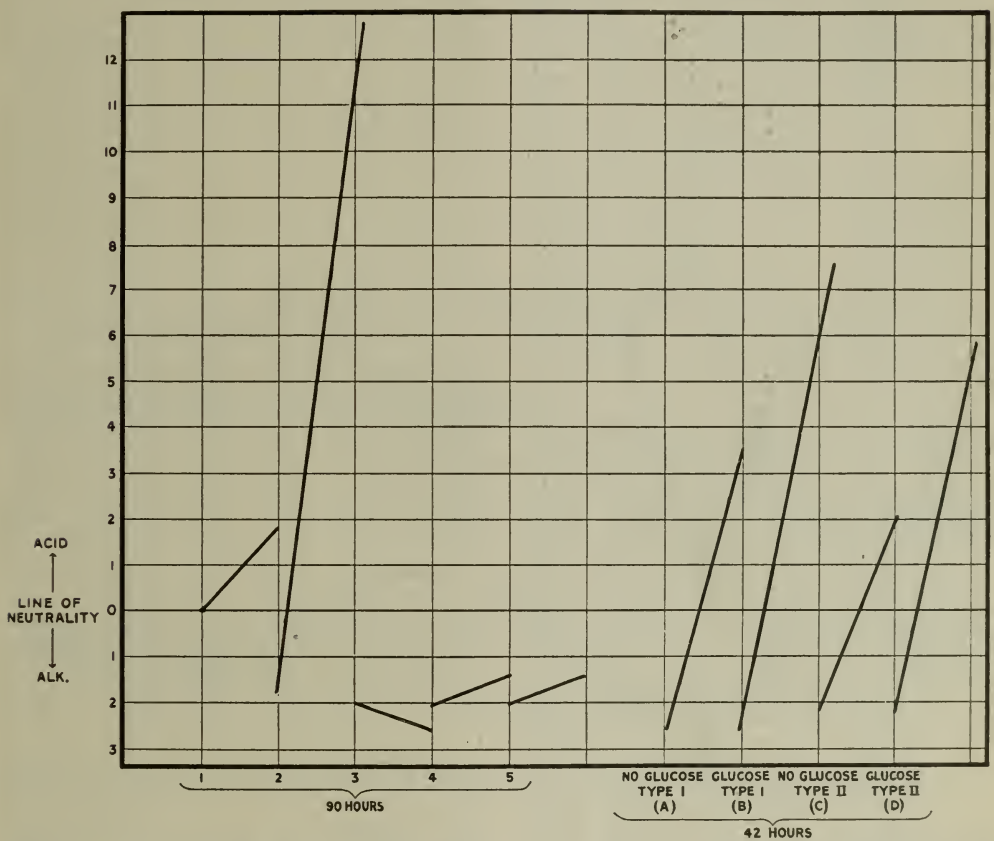
2.50 P.M., 2.5 cc. (acid) required 0.9 cc. N/40 NaOH solution.

3.00 P.M., 7 gm. acid drops were dissolved in the mouth; 28 cc. were collected, and required 6 cc. solution for neutralization.

3.10 P.M.,	2.5 cc. saliva	required	0.75 cc.
3.20 P.M.,	2.5 cc. "	"	0.70 cc.
3.30 P.M.,	2.5 cc. "	"	0.70 cc.
3.40 P.M.,	2.5 cc. "	"	0.70 cc.
3.50 P.M.,	2.5 cc. "	"	0.80 cc.
4.00 P.M.,	2.5 cc. "	"	0.70 cc.
4.10 P.M.,	2.5 cc. "	"	0.70 cc.
4.20 P.M.,	2.5 cc. "	"	0.85 cc.

Chart I.

THE RESULTS OF OBSERVATIONS RECORDED IN EXPERIMENTS SERIES B AND C.



The results for Series B are presented on the right, and for Series C on the left. The vertical numbers indicate the relative degrees of acidity or alkalinity.

(b) *Plain chocolate.*

1.50 P.M., 2.5 cc. acid saliva, type I, required 1.4 cc. N/40 NaOH solution for neutralization.

2.00 P.M., 7 gm. plain chocolate were dissolved in the mouth, and 18 cc. collected; 2.5 cc. of the alkaline filtrate were ultimately neutralized by 1.8 cc. N/75 $(CHOHCOOH)_2$.

2.10 P.M., 2.5 cc. saliva required 1.8 N/40 NaOH.

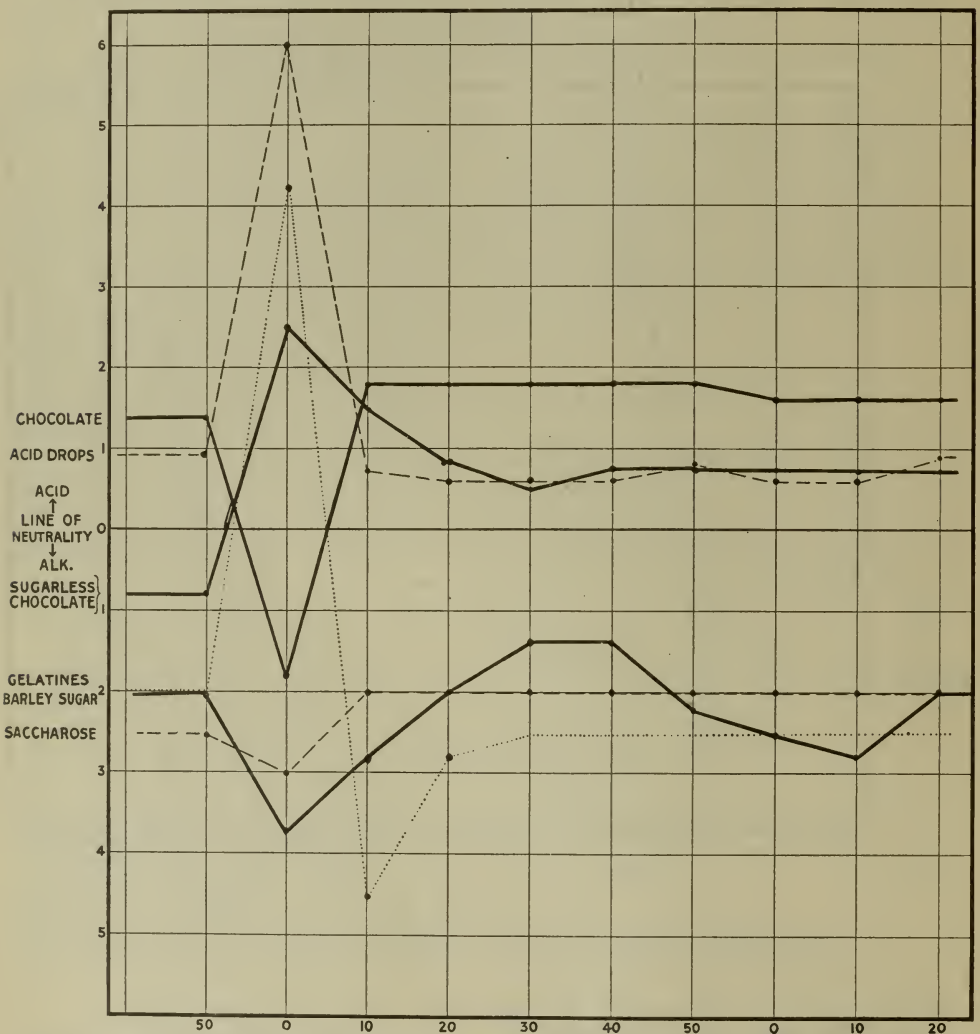
2.20 P.M., 2.5 cc. saliva (stained brown) required 1.8 N/40 NaOH.

2.50 P.M., 2.5 cc. saliva (clear) required 1.8 N/40 NaOH.

3.00 P.M.. 2.5 cc. saliva (clear) required 1.6 N/40 NaOH.

Chart II.

THE IMMEDIATE AND REMOTE ACIDIMETRIC AND ALKALIMETRIC VARIATIONS OF TYPE I SALIVA DESCRIBED IN EXPERIMENTS SERIES A AND D, WHEN AFFECTED BY CERTAIN CANDIES.



Drawn to scale. The vertical numerals represent the amounts of these variations; the horizontal numerals denote ten-minute observations.

2.30 P.M., 2.5 cc. saliva (stained brown) required 1.8 N/40 NaOH.

2.40 P.M., 2.5 cc. saliva (clear) required 1.8 N/40 NaOH.

3.10 P.M., 2.5 cc. saliva (clear) required 1.6 N/40 NaOH.

3.20 P.M., 2.5 cc. saliva (clear) required 1.6 N/40 NaOH.

3.30 P.M., 2.5 cc. saliva (clear) required 1.6 N/40 NaOH.

(c) *Barley sugar.*

2.50 P.M., 2.5 cc. of alkaline saliva, type I, required 2.0 N/75 $(CHOHCOOH)_2$ for neutralization.

3.00 P.M., 7 gm. of barley sugar were dissolved in the mouth and 16 cc. collected: 2.5 cc. saliva (straw-yellow, viscous) required 3.75 cc.

3.10 P.M., 2.5 cc. saliva (clear) required 2.8 cc.

3.20 P.M., 2.5 cc. saliva (less viscous) required 2.0 cc.

3.30 P.M., 2.5 cc. saliva (less viscous) required 1.6 cc.

3.40 P.M., 2.5 cc. saliva (less viscous) required 1.5 cc.

3.50 P.M., 2.5 cc. saliva (less viscous) required 2.25 cc.

4.00 P.M., 2.5 cc. saliva (less viscous) required 2.50 cc.

4.10 P.M., 2.5 cc. saliva (less viscous) required 2.75 cc.

4.20 P.M.—No observations made.

4.30 P.M., 2.5 cc. saliva required 2.0 cc.

The probable reason why barley sugar was alkaline throughout was because it was manufactured from cane sugar, which is not inverted in the mouth unless it comes into contact with some acid reagent or some dilute mineral acid, when it takes up water and is split into equal parts of dextrose and levulose (both glucoses)—thus:

$$\underset{\text{Cane sugar.}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Levulose.}}{C_6H_{12}O_6}.$$

Cane sugar, as found in ordinary table crystalline white sugar, remains as cane sugar unless the secretions of the mouth are acid.

(d) *Sugarless chocolate.*

5.20 P.M., 2.5 cc. acid saliva, type II, required 0.8 cc. N/75 tartaric acid solution for neutralization.

5.30 P.M., 7 gm. of sugarless chocolate were dissolved in the mouth and collected. This was filtered, and next day the filtrate was tested. It required 2.5 cc. NaOH for neutralization.

5.40 P.M., 2.5 cc. saliva req. 1.5 cc. NaOH.
5.50 P.M., 2.5 cc. " " 0.8 cc. NaOH.
6.00 P.M., 2.5 cc. " " 0.5 cc. NaOH.
6.10 P.M., 2.5 cc. " " 0.65 cc. NaOH.
6.20 P.M., 2.5 cc. " " 0.60 cc. NaOH.
6.30 P.M., 2.5 cc. " " 0.6 cc. NaOH.

Chocolates vary remarkably in their constituents. Some contain from 50 to 55 per cent. cane sugar, 18 to 25 per cent. fat, 1 per cent. fibrin, a certain amount of "reducing" sugar, and varying amounts of wheat starch and arrowroot. It is probably to the latter that the harmful effects are due. Chocolate is frequently rendered alkaline by the addition of ammonia or sodium or potassium carbonates in order to emulsify and saponify the fats in the cocoa and make it more soluble.

(e) *"Gelatines."*

2.50 P.M., 2.5 cc. of alkaline saliva (type I) required 2 cc. N/75 $(CHOHCOOH)_2$ for neutralization.

3.00 P.M., 7 gm. of gelatines were dissolved in the mouth, 32 cc. being subsequently collected. The filtrate required 4.25 cc. N/40 NaOH. (Pale brown, viscous.)

3.10 P.M., 2.5 cc. saliva (clear) required 4.75 cc. N/75 $(CHOHCOOH)_2$.

3.20 P.M., 2.5 cc. saliva (clear) req. 2.75 cc.
3.30 P.M., 2.5 cc. " " " 2.75 cc.
3.40 P.M., 2.5 cc. " " " 2.50 cc.
3.50 P.M., 2.5 cc. " " " 2.50 cc.
4.00 P.M., 2.5 cc. " " " 2.50 cc.

"Gelatines" are believed to be flavored slightly with citric or tartaric acid.

Series E (a).

A large piece of carious dentin including both deep and superficial layers, removed from a freshly extracted tooth, was placed in a test tube containing peptone beef broth, and incubated. At the end of seventy-two hours the fluid, having become turbid, was removed, and tubes of sterilized nutrient agar kept fluid at a temperature of 48°C., inoculated by means of two platinum öses of broth. Petri dishes received the melted carious agar solution, and into each of these was placed at one side of each dish (i) plain chocolate, (ii) "cream" from chocolate cream, (iii) acid drops, (iv) caramel, (v) toffee, (vi) barley sugar; a control (vii) was simultaneously prepared.

The results at the end of twenty-four hours gave the following particulars:

(1) Plain chocolate was bacteriophile, the colonies closely applying themselves to the sweetmeat; a "condensation band" 3.5 cm. wide, where the colonies were exceedingly numerous, was present.

(2) "Cream" had a semi-halo of colony-free material measuring 4 cm. in diameter, and a "condensation band" of 1 cm.

(3) "Acid drops" was almost similar, the semi-halo measuring 4 cm. and the "condensation band" 1 cm.

(4) Caramel had colonies closely approximated to the sweetmeat.

(5) Toffee had a growth measuring 4.5 cm.

in width close up to the material, and "condensation band" of 1 cm. in width.

(6) Barley sugar had a semi-halo of colony-free material 5 cm. wide and "condensation band" 1.25 cm.

(7) The control had numerous colonies equally distributed. These were mainly small, discrete, round, capitate, smooth, homogeneous, homochromous, with entire edges. It was unnecessary to make a qualitative examination of them.

Thus it would appear that chocolate, caramel, and toffee were bacteriophile, and "acid drops," "cream" from chocolate, and barley sugar were bacteriophobe.

Series E (b)

Litmus agar was used for these experiments. After incubation for fourteen hours, acid drops, chocolate, chocolate cream, and barley sugar turned the blue into a pink color for some distance around the edges. The control used retained its color, showing that the caries-producing micro-organisms *per se* had not acidulated the medium in which they were growing. They were those associated with deep-seated dental caries.

Series F.

This group includes the use of sound teeth, premolars and molars, treated in two ways: (1) So placed that candies were made to lodge between them, and (2) containing artificially prepared cavities in their crowns.

On June 5th, certain sound teeth were embedded in quickly setting superfine plaster of Paris side by side, so that their mesial and distal surfaces were almost approximated. After extraction they were at once washed and immersed in 30 per cent. alcohol, and throughout the operations were kept moist in order to prevent any superficial minute cracking of the enamel. In this way three pairs of maxillary premolars, three sets of three maxillary premolars, three pairs of one maxillary premolar, and one set of three mandibular premolars were employed. Rubber dam was stretched between the teeth over the plaster, which was covered with a layer of shellac in order to prevent the saliva from acting upon the plaster. The cavities varied in size, but approximately measured $4 \times 3 \times 3$ mm. Salivas of types I and II were collected.

On June 10th, at 7.30 P.M., in a stoppered jar were placed two premolars, and squeezed in an interstitial position between them was caramel, and type II saliva (acid) used, and also in the crown cavity, and type I (alkaline) chocolate, and also in the crown cavity, and in another jar toffee.

On June 25th, at noon, into the beforementioned cavities were placed plain chocolate, caramel, acid drops, and a "control" of nothing was made—in which, however, of course the saliva was allowed freely to enter or collect. The reactions of the salivas were tested, and all had become acid fourteen hours afterward, but in order to keep the originally alkaline saliva of type I alkaline, two platinum öses of calcium carbonate and four of sodium carbonate were added. These were examined on July 19th, at 4 P.M.

Jar No. 5, containing type I saliva which had become strongly acid, and a premolar and molar with plain chocolate placed interstitially and on the crowns, was removed from the incubator. Two or three soft spots in the fissures of both teeth, but the molar especially, had developed during the forty days of incubation and easily admitted the end of a fine needle, the digital sensations being practically identical with those associated with the initiation of dental caries in the mouth. There was slight discoloration of the enamel on the approximal surfaces, but macroscopically no dissolution of the hard tissues.

Similarly, jar No. 36 was examined. Caramel had produced in saliva type II, which had become very acid, two soft spots, each admitting penetration by the point of a needle. In addition there were patches of discoloration opposite each other on the approximal surfaces of the teeth.

Summary.

To sum up: There are evidences of an inductive character—(*a*) That alkaline saliva when kept at body temperature, as in the biological incubator, soon becomes acid in reaction without any alien additions; (*b*) that the presence of glucose increases this acidity; (*c*) that caries-producing bacteria do not increase this acidity; (*d*) that sugar solutions (glucose) become acid when these bacteria are present; (*e*) that the alkalinity of saliva is unaffected by their presence; (*f*) that a few bacteria are as potent as many; (*g*) that "acid drops," "barley sugar," etc., are bacteriophobe, and chocolate, "caramel," toffee, etc., bacteriophile; (*h*) that the salivary reactions, disturbed by the use of sweetmeats, return to the normal almost immediately; (*i*) that while plain chocolate increases

the acidity of the saliva, sugarless chocolate, "barley sugar," "gelatines," etc., are particularly innocuous; (*j*) that superficial changes in the enamel leading to decalcification of that tissue can be set up by such sweetmeats as chocolate and "caramel" in the presence of very acid saliva, from the mouth of an immune as well as from the mouth of a non-immune.

The last statement is an exceedingly important one. It is correct, and at present its significance cannot be estimated.

MALPOSITIONS OF THE TEETH.

As has been already remarked, the irregular position the teeth may occupy in the dental arch has been considered a local predisposing cause of caries, for the simple reason that the cleansing of the surfaces of such malposed organs is difficult, if not at times impossible. We are also informed that areas exist around the neck of each tooth. Food accumulates in these positions, ferments and caries theoretically is started. This may be true; it may be partially true, and it may be untrue. If it were always true one would expect to find interstitial caries all the time at the cervical and gingival region; and we know that this is not the fact.

Now, there may be a valid reason why this does not occur. It is just possible that the micro-organisms inhabiting the gingival trough manifest a distinct antibiotic action with regard to the caries-producing organisms.

What are the contents of the gingival trough in a normal mouth?

Working in conjunction with the bacteriologist of the Royal Dental Hospital of London, I found micro-organisms present in the gingival trough in each of seven selected patients who possess normal mouths.

The following are the brief histories of these cases:

(*A*) Girl six years. Nasal breather; no caries; fillings in the mandibular first molars; the gingival trough of the first right and left maxillary incisors was examined; depth 4 mm.

A sterilized point, passed into the trough, conveyed micro-organisms to a cover-glass of a microscope slide, which on examination showed numerous bacteria, bacilli, and micrococci. Peptone broth inoculated. After forty-eight hours a marked general turbidity occurred. Plated on agar. Result: Numerous streptococci and a large colony-forming organism.

(*B*) Girl of six and one-half years. Healthy mouth. Nasal respiration. The oral cavity was washed with a weak formalin mouth-bath (about 2 per cent.) twice daily for seven days. No caries; no gingivitis. Culture taken from gingival trough 2 mm. deep around maxillary right canine. There was a history of earache. Result: Three varieties of colonies—(i) small, white, streptococcus-like; (ii) medium, white opaque; (iii) large, white, some grayish-yellow in color.

(*C*) Girl of eleven. Nasal respiration; no gingivitis; no caries. Examined the gingival troughs of second maxillary left incisor and left maxillary canine. Depth approximately 2.5 mm. Inoculated from contents a tube of peptone broth. After forty-eight hours a turbidity with visible clumps and small flocculi occurred. Plated agar. Result: Numerous streptococci and unidentified micrococcus.

(*D*) Boy of twelve. Nasal respiration; left mandibular molar, slight decay. Examined gingival troughs of first and second left maxillary incisors; trough approximately 2.5 mm. deep. The gum and teeth were dried with cotton, the edge of the trough being everted with sterilized points and a sterilized platinum needle passed into it without touching the surface of the tooth.

Inoculation of peptone broth was made. After forty-eight hours the turbidity due to the presence of visible clumps of bacteria was noticed. Plated out on agar. Result: Numerous streptococci, also an unidentified micrococcus.

(*E*) Boy of twelve. No caries; no gingivitis; nasal breather. Rubber dam was passed over the two first maxillary incisors, which were then well swabbed with absolute alcohol. Cultures placed in bouillon. Gingival trough depth on one side 2 to 3 mm., on the other side 3 to 4 mm. Result: Long filamentous bacilli, with shorter forms, were seen in films taken direct from the trough. No growth in the peptone broth observed; no growth on the subculture on agar.

Subcultures were therefore made seven days later on glycerin agar and on glycerin blood-agar, with no result. There was probably present, however, a leptothrix difficult to cultivate. A slight preparation taken directly

from the trough exhibited enormous numbers of bacteria and a few degenerated (?) squamous epithelial cells, the nuclei showing up faintly. Amorphous organic material, possibly food débris or broken-down cells from the oral epithelium. The bacteria are mainly bacilli; there are also filamentous organisms sending out filaments from a central clump. The degenerated (?) cells exhibit numerous bacilli in close relationship to them. Micrococci possibly present, but greatly obscured by the preponderating bacilli.

(*F*) Boy of nineteen. Normal mouth. Examined maxillary incisors; culture and slide preparations made. Result: A white confluent growth occurred in the former, overrunning the agar plate. Gelatin was liquefied in seventy-two hours. Under the microscope many spores were remarked, as well as a few squamous epithelial cells.

(*G*) Girl of twenty. Normal mouth. Films and cultures prepared as above. Result: Two varieties of colonies observed, (i) a streptococcus forming long chains in bouillon, giving an acid reaction in glucose, lactose, and maltose, and coagulating milk in litmus milk with the production of lactic acid; (ii) a Gram-negative micrococcus forming groups in bouillon and fermenting glucose and maltose.

From these it can be noted that out of the seven cases investigated, one—the last named—showed the existence of an acid-forming organism. The other materials were not specially tested out for this reaction, but it is extremely likely that had this been done it would have been found that it too contained many acid-producing organisms, inasmuch as there were in all but two (*E* and *F*) streptococcus forms, of which the greater part are usually acid-forming.

It may be therefore generally conceded that in the gingival trough of all normal mouths acid-producing organisms are present—yet caries is very uncommon in this region. What is the explanation? It may be that the parts are protected by Nasmyth's membrane, or that a state of antibiosis exists in these particular cases.

FURTHER OBSERVATIONS.

I have recently performed the following experiments in the bacteriological laboratory of the Evans Institute of the University of Pennsylvania, with a view to observing the behavior of these organisms in the presence of the food which had been prepared for deglutition by mixing with mixed saliva for one minute in an immune mouth. Alkaline saliva was used.

(1) 1 cc. of soup and mixed saliva was incorporated with litmus agar in Petri dish which had been previously inoculated with two loopfuls of bouillon infected for seventy-seven and a half hours by organisms from deep-seated dental caries.

(2) Same using boiled carrot.
(3) " " boiled potato; no salt.
(4) " " roast beef.
(5) " " lettuce leaf; no salt.
(6) " all mixed together.
(7) Control.

Examination after forty-two hours showed—

(1) Litmus agar pink in color; acid reaction; no colonies.
(3) Pink coloration; no colonies.
(4) " " " "
(5) " " " "
(6) " " " "

With regard to carrot (No. 2) it was found that at the end of eighteen hours the blue litmus agar had become slightly pink, with some colonization, probably two varieties of organisms had developed, some showing the action of their proteolytic enzymes. At the end of forty-two hours the original alkalinity of the medium had become nearly completely restored, and large masses of numerous fluent colonies had developed upon it.

The medium plated with the control culture had become slightly acid at first (eighteen hours after incubation), and at the end of forty-eight hours became alkaline in places. A large growth of colonies occurred, differing from those in the dish containing the carrot in appearance and dimensions, many being punctiform in character.

The reason why colonization did not take place is obviously on account of the fact that the saliva, alkaline at first, had during incubation become acid, thus preventing bacterial growth.

Repeated, the results are seen in Chart

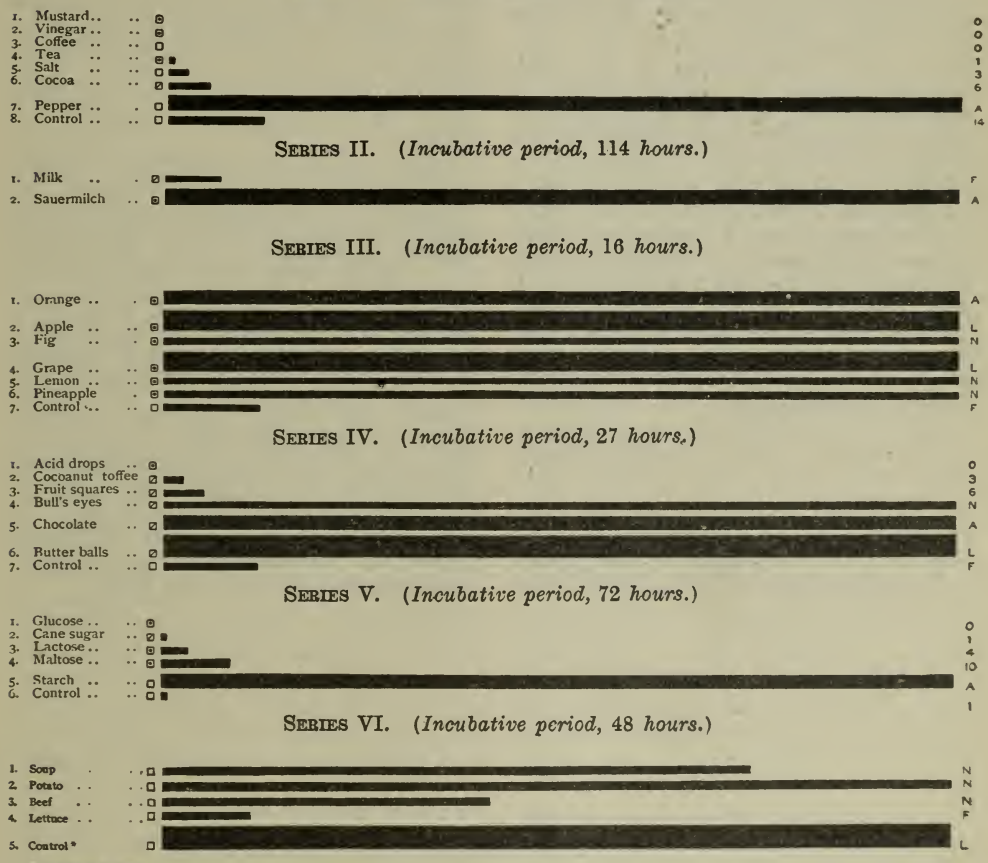
III, Series 6. The "control" consisted of a pure culture of yeasts.

The Petri dishes were again examined at the end of 240 hours. On the soup culture twelve large colonies of a deep yellow color had appeared, showing the presence of a chromogenic organism. On the potato one large orange-colored and one pale yellow colony were seen. On the control several pale yellow colonies had developed. These were, microscopically, a large micrococcus, a short sporulating bacillus, and a mixed colonization with a few yeasts. Degenerate and involution forms were present. The above were the effects of mesophilic incubation.

Seventy-two hours later, one pink colony had developed, at mesophilic temperature, on the Petri dish plated with the control inoculation.

Chart III.

TABLE OF RELATIVE GROWTH OF CARIES-PRODUCING MICRO-ORGANISMS IN THE PRESENCE OF VARIOUS DIETETIC SUBSTANCES.



EXPLANATION OF SIGNS AND LETTERING.

⊖ = Acid.
□ = Alkaline.
⊘ = Neutral.

N = Numerous.
A = Abundant.
L = Luxuriant.
F = Few.

CONCLUSION.

Toward the end of an excellent report on the "Etiology of Dental Caries" pre-

sented to Section II of the Sixth International Dental Congress last August, Pickerill writes:

To the etiology of dental caries a large number of factors may or do contribute. There are four chief factors, two attacking, carbohydrates and organisms; and two defensive, the resistance of the enamel surface and the protective action of the salivary secretion. Each of these may vary more or less, and so the possible permutation and combinations favoring caries are approximately 24. But each of these factors is composed of a large number of contributing factors: The variations in the fermentability of the carbohydrates consumed, the number and type of organisms present, the different possible weaknesses of the enamel surface, and the varying amounts of the chemical constituents of saliva. In addition, there are the other systemic factors of internal secretions and hypernervous development. I have made a rough estimate of the possible permutations and combinations of all these factors, and find it is about 3,628,000. That is to say, in 3,600,000 cases of caries no two might have exactly the same combinations of causes. . . . There is no golden key to be discovered to unlock the riddle of dental caries.

With some of the above I am in agreement, but I feel convinced that until our knowledge of the laws of symbiosis, antibiosis, and commensalism, as practiced by the oral flora, is more exact, and our knowledge of the salivary secretion more complete, we cannot be certain as to their influence in the causation of dental caries.

If it is assumed that the number of the micro-organisms in the oral cavity must be reduced, it is plain that this can be done by hygienic means, and by the exhibition of warm water or of weak acids which inhibit bacterial growth while doing no harm to Nasmyth's membrane or the enamel surfaces;—acting on the hypothesis also that by using these measures we may destroy the beneficent influence they may possess, and perhaps alter or modify in some way the phagocytic action of cells inhabiting the oral cavity.

One thing would appear to be obvious —that the mechanical cleansing of the mouth and its contained organs is of the highest importance, that its sterilization is an impossibility, and probably an undesirability, and that the use of chemical agents and antiseptic remedies may, generally speaking, be not only valueless but sometimes actually harmful to the tissues, and should therefore be studiously avoided, unless their uses are distinctly indicated by signs and symptoms the significance of which are satisfactorily and convincingly established.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE TREATMENT OF PYORRHEA ALVEOLARIS AND ITS SECONDARY SYSTEMIC INFECTIONS BY DEEP MUSCULAR INJECTIONS OF MERCURY.

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(Read before the New Hampshire State Dental Society, at its annual meeting, Weirs, N. H., June 22, 1915.)

THE vital importance of pyorrhea alveolaris has only been recognized during the past few years; its local ravages and intractability to treatment, long known to the dental profession, have received but little attention from the medical profession. The dentist's repeated suggestions relating to the probability of its frequently being the source of many systemic infections have been unheeded by physicians, but the writings of many prominent medical authorities during the past two years have caused this disease to be recognized as the dominant productive factor in many of the systemic infections, among which may be mentioned acute and chronic infectious arthritis—so-called "rheumatism"—myositis, endocarditis, neuritis, gastric ulcer, appendicitis, and many others.

The cure of this disease demands our best thought and efforts, as it is of the utmost importance, not only for the prevention of its local ravages, but as a prophylactic measure against secondary systemic infection, with its serious and sometimes fatal results; or, when this invasion has already taken place, to insure the removal of the source, thereby making the permanent cure of the systemic infection a possibility.

BACTERIOLOGY OF PYORRHEA ALVEOLARIS.

No one organism can be held responsible as the specific cause of this infection; from the investigations of many bacteriologists it is certain that sooner or later it will be a multiple infection. Any one of the entire group of vegetable parasites in association with others of this group may be found present in one case or another. Rosenow believes that the dominant organisms concerned in the production of pyorrhea belong to the streptococcus-pneumococcus group, and that these also comprise the important pathogenic bacteria related to systemic infection—which beliefs are amply sustained clinically.

CALCARIOUS DEPOSITS.

Besides the bacterial infection, there is a second factor that requires every consideration, viz, that in a very large majority of cases calcarious deposits occur to a greater or lesser degree along the roots and necks of the teeth, which, acting as foreign bodies, are a constant source of local irritation. It is therefore obvious that in order to cure this disease in the large majority of cases two courses of treatment must be pursued at the same time: (1) The infecting organism or organisms must be attacked by the use of some parasitotropic agent, and (2) during the administration of this agent, surgical interference must be resorted to locally, removing all calcarious deposits and tartar wherever found, and the toilet of the oral cavity must be made as perfect as possible.

These procedures can best be carried into effect through the active and intelli-

gent co-operation of the physician and dentist.

PARASITOTROPIC ACTION OF MERCURY.

The multiplicity of the organisms productive of this infection makes it necessary to select for systemic administration an agent parasitotropic to them all. That mercury in proper doses and properly administered has this qualification when the vegetable parasites are in question, I have repeatedly demonstrated. Furthermore, mercury has the power of inciting in the presence of vegetable antigen, the rapid production of a specific antibody.

APPLICATION AND DOSAGE OF SUCCINIMID OF MERCURY.

In this disease, in the male patient, a deep muscular injection of mercuric succinimid gr. 1 (65 mgm.) should be administered every seventh day, until the discharge of pus has entirely disappeared, and the gums have regained their normal condition and appearance. If the pockets have not been entirely obliterated and the loose teeth have not become firmly fixed by this time, they will quickly do so without further treatment, providing the hygiene of the mouth and teeth is properly carried out.

Of course, when a tooth socket has become destroyed by alveolar absorption, it is impossible for the tooth to become fixed, and it should be removed.

In female patients the dose should be from gr. $\frac{1}{5}$ (13 mgm.) to gr. $\frac{2}{5}$ (26 mgm.) less than that administered to males. Mercurialism of any marked degree should be met with smaller doses at succeeding injections, or, if the symptoms are severe, the mercury is discontinued until they have disappeared.

In treating cases complicated by a secondary systemic infection, the dosage and interval between injections will materially differ from the above, according to the nature of the secondary infection, whether acute or chronic, severe or mild, etc. As this question more properly belongs to the realm of internal medicine, I refer those interested to my former publications.*

I have seen several cases of pyorrhea recover completely under the above treatment without local surgical intervention, but these were those in which calcarious deposits and tartar had not formed, nor was the omission of local treatment desired by me, but due to the absence on leave of my dental colleague.

LOCAL TREATMENT.

The local treatment as administered by Dr. P. G. White embraces the following steps: Careful expression of the pus from the pockets, thorough removal of calcarious deposits and tartar wherever found; extraction of hopeless teeth and roots, polishing of the tooth structure, followed by applying to the margin of the gums equal parts of tincture of iodin, tincture of aconite, and chloroform, continued every other day. This latter procedure may be, and has been omitted in many of our cases without any appreciable difference in the time required to effect a cure, but we consider it a valuable adjunct to the local curettage and systemic treatment.

Including the twenty-eight cases reported cured in the *Medical Record* of March 13, 1915,† we have now, on June 3, 1915, treated sixty consecutive cases, with 100 per cent. of cures and not a single recurrence.

CONCOMITANT SYSTEMIC INFECTIONS CURED BY SUCCINIMID OF MERCURY TREATMENT.

No treatment advocated for this disease has given results which can compare with these, yet more and possibly greater things can be claimed for it, for

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* "The Treatment of Diseases of Vegetable Parasitic Origin by Deep Muscular Injections of Mercury," by B. L. Wright, *Medical Record*, July 11, 1914.

† The Treatment of Pyorrhea Alveolaris and Its Secondary Systemic Infections by Deep Muscular Injections of Mercury," by Dr. B. L. Wright and Dr. P. G. White.

among these sixty cases were a number which presented systemic infection in all probability secondary to the pyorrhea, viz, four cases of acute infectious arthritis—so-called acute rheumatic fever —nineteen cases of chronic infectious arthritis, one of chronic gastritis, one of chronic bilateral facial neuralgia, one of chronic laryngitis, one of chronic otitis media, and two of severe chronic lumbar myositis—lumbago—or 48.33 per cent. of the total number of cases treated, all of which were completely cured in remarkably short periods of time. In addition two had gonorrheal arthritis, which was also cured. Another had syphilitic arthritis—Wassermann 4 plus; in this case the pyorrhea was cured by four injections in sixteen days, but the syphilitic arthritis was decidedly worse —Wassermann 3 plus. The patient was then transferred to the hospital, where, following the first injection of 900 mgm. neosalvarsan, the arthritis disappeared, and the Wassermann became negative.

The high percentage—38 per cent.—of arthritic cases in this series is due to the fact that these men first reported for treatment of so-called rheumatism, and the pyorrhea was discovered when search was being made for a local focus of infection.

NUMBER OF INJECTIONS.

The longest period of time required to effect a cure was forty-one days, the shortest four days; average seventeen days. The greatest number of injections required to cure the primary infection in any one case was seven, the smallest number one; average 2.9. The diagnosis in each case was based upon classical symptoms and conditions; pus was present in every case, the presence of slight pathological changes in the gum tissue, or of any particular organism, not being considered as diagnostic.

By *cure* I mean the total disappearance of pus, the gums becoming normally pink, hard, and firm, the filling-in and obliteration of pockets, and the firm fixation of loose teeth provided the alveolar processes had not been absorbed.

CORROBORATIVE EVIDENCE.

Further proof of the value of this method of treatment is that A. A. Dent. Surgeon G. H. Reed, U. S. navy, reports treating at the navy yard, Boston, Mass., twenty-nine consecutive cases, twenty-eight of which were completely cured, while the twenty-ninth was markedly improved, when the ship to which he was attached sailed, preventing further treatment and cure.

Samuel T. Ladd, M.D., of Portsmouth, N. H., co-operating with E. C. Blaisdell, D.M.D., of Portsmouth, and several others of the same place, reports eight consecutive cases treated and cured, making in all ninety-seven cases treated, with practically 100 per cent. of cures.

CASE HISTORIES OF PYORRHEA.

The following are examples of cases treated, and the results of treatment:

CASE 1. E. S. J. Pyorrhea, mild, involving processes of all upper teeth.

Injections of mercuric succinimid were given as follows: *Sept. 25th*, gr. 6/5. *28th*, cured.

CASE 2. L. P., corporal of marines. Pyorrhea, moderately severe case, involving processes of upper and lower central teeth.

Injections of mercuric succinimid were given as follows: *Aug. 27th*, gr. 5/5. *Sept. 2d, gr.* 4/5. *4th*, cured. No further treatment.

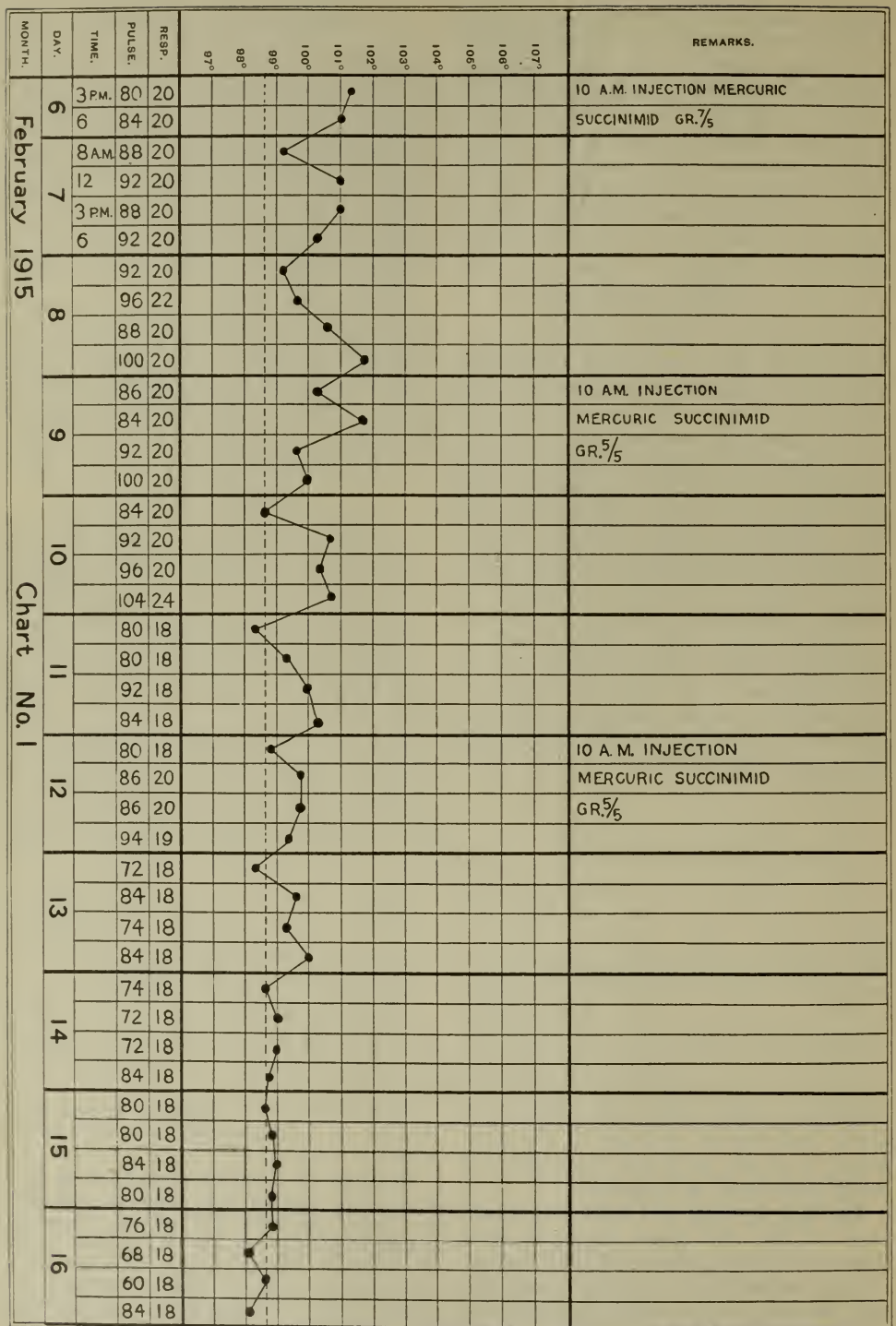
CASE 3. W. J. S., chief quartermaster. Pyorrhea, severe, involving processes of all teeth, all of which are loose. Complains of indigestion and very poor appetite.

Injections of mercuric succinimid were made as follows: *Sept. 5th*, gr. 5/5. *12th*, gr. 5/5. *19th*, gr. 3/5. *22d*, cured. Gastric symptoms disappeared; has excellent appetite.

CASE 4. G. W. S. Pyorrhea, severe, large amount of pus discharging around every tooth.

Injections of mercuric succinimid as follows: *Nov. 21st*, gr. 6/5. This was followed by severe gingivitis and angina. On the twelfth day following, *Dec. 3d*, gr. 3/5. This was followed by rather severe abdominal pain, diarrhea, and rectal tenesmus, patient evidently having an idiosyncrasy for mercury. *Dec. 13th*, gr. 2/5. *20th*, gr. 2/5, cured.

CASE 10. *CLINICAL CHART.*



Case 5. Mrs. X. Pyorrhea, moderately severe, gums soft, spongy, tender, and with tendency to bleed. Condition had existed some time. Since middle of August had been receiving local treatment from a local dentist. In latter part of August developed a perialveolar abscess above upper left first molar. Old filling removed and root-canals treated and tooth refilled. Later the abscess was incised, drained, and cavity swabbed with pure iodin, without improvement. November 11, 1914, condition of gums as above. Over upper left first molar a chronic perialveolar abscess was present, discharging pus through a patulous operative sinus, with a free discharge of pus from around the tooth, which was quite loose. The upper right bicuspids were loose, with a free discharge of pus from around them.

Injections of mercuric succinimid were as follows: *Nov. 12th*, gr. 7/10. *16th*, gr. 1/2. Following these, the pus entirely disappeared, the abscess sinus closed. *Nov. 24th*, injection, gr. 3/5. *26th*, cured. *30th*, gr. 2/5 as precautionary measure.

Case 6. L. P. McC. Pyorrhea, severe, extensive calcarious deposits about the neck of every tooth, free flow of pus from around all teeth. The injections in this case were given by P. A. Surg. G. E. Thomas, U. S. navy, at the naval prison, and through some oversight three were given before local treatment was commenced on November 28th.

Injections of mercuric succinimid as follows: *Nov. 13th*, gr. 5/5. *20th*, gr. 5/5. *27th*, gr. 5/5. *Dec. 4th*, gr. 4/5. *14th*, gr. 4/5. *16th*, cured.

Case 7. S. K. Pyorrhea, severe and extensive. Subacute gonococcic urethritis. Gonorrheal arthritis.

Injections of mercuric succinimid were given as follows: *Aug. 16th*, gr. 6/5. *25th*, gr. 4/5. *Sept. 2d*, gr. 4/5. *4th*, gr. 4/5, pyorrhea cured. *9th*, gr. 3/5. *16th*, gr. 3/5. No discharge from urethra for past ten days. Urine free from shreds. Arthritis cured.

Case 8. A. W. D. Referred to Dr. P. G. White by P. A. Surg. Wheeler for local treatment of severe and extensive pyorrhea on August 19th. Dr. Wheeler had on August 18th injected mercuric succinimid, gr. 6/5, the patient also having gonorrheal arthritis. *Aug. 19th*, gr. 5/5; gingivitis followed. *26th*, gums still slightly tender, but pus has entirely disappeared. *Sept. 2d*, gr. 4/5. Pyorrhea and arthritis cured.

Case 9. A. W. O. Pyorrhea, calcarious deposit and gum recession extreme. Discharge of pus from around every tooth. States that he is subject to frequent attacks of laryngitis and tonsillitis.

Injections of mercuric succinimid as follows: *Nov. 14th*, gr. 5/5. *21st*, gr. 5/5. *28th*, gr. 5/5. *30th*, cured.

CASES OF ACUTE INFECTIOUS ARTHRITIS.

The following case of acute infectious arthritis (so-called acute rheumatic fever), which represents the average of the four cases occurring in this series, demonstrates the marked superiority of mercury in the treatment of this disease over any of the accepted methods. It shortens the duration of the attack in a pronounced degree. The duration of the fever is markedly curtailed, its average duration in these four cases being 8¼ days. Pain is reduced to a minimum, and in none of these cases was an opiate required at any time following the primary injection of mercuric succinimid. The patients do not lose weight or strength, and they are permitted to eat whatever they desire.

Case 10. L. P., a male of thirty-four. Admitted to the sick list on board the U. S. S. "Southery," February 6, 1915, with following history: Two years ago had an attack of "acute rheumatism;" prior to and since that time perfectly well. On or about February 1, 1915, the patient began to have slight pain in right knee-joint; this had slowly increased, and on February 5th the left knee became involved.

February 6th, the patient reported for treatment in the following condition: Both knee-joints were swollen and extremely painful and tender; the elbow and shoulder-joints were in the same condition. Temperature 101.2°, pulse 80, respirations 20. No history or symptoms of syphilis; prostate and urethra normal. Teeth and gums presented a severe and extensive pyorrhea. Diagnosis—acute infectious arthritis, secondary to pyorrhea. To bed; injection of mercuric succinimid gr. 7/5. No local or other systemic treatment.

February 7th, pain and swelling had disappeared from shoulder and elbow-joints. *9th*, still further improved; injection of mercuric succinimid gr. 5/5. *10th*, all joints practically normal, very slight pain in the knees. *11th*, pain disappeared. *12th*, injection of mercuric succinimid gr. 5/5. *13th*, no pain. *14th*, temperature and pulse normal (see chart opposite), no symptoms, con-

valescent. *18th:* Discharged to duty, with arthritis cured. *24th:* Referred to the dental surgeon of the yard for local treatment of pyorrhea. *25th:* On this date and *March 4th* and *11th* he was given an injection of mercuric succinimid gr. 5/5. *March 15th:* Pyorrhea cured.

EXTREME CASE OF CHRONIC INFECTIOUS ARTHRITIS.

The following case of chronic infectious arthritis also demonstrates the superiority of mercury in the treatment of these infections, especially when combined with the cure and consequent removal of a local infection, probably the source of the systemic invasion.

Case 11. J. P. G., private, marines. Enlisted February 12, 1914. Age twenty-two. Admitted for treatment on board U. S. S. "Southery," February 15, 1915, with the following history, which is copied in full from his health record: He served at Norfolk barracks from February 12 to April 22, 1914, when he was transferred to the Third regiment, with no sick days. On April 29th he was transferred to the artillery battalion, Vera Cruz, Mexico, with no sick days. Here his medical history begins:

"Artillery Battalion, Marine Brigade, Vera Cruz, May 23, 1914. Admitted. Dysentery, bacillary. Duty, tropical exposure. Reported sick two days ago; diarrhea, griping, tenesmus, etc. Rest in bed, bismuth and C. & O. pills; yesterday had fever to 101° F. Temp. this A.M., 100° F. Has blood and mucus in stools. Frequent passages, 15 to 20 in twenty-four hours. Transferred to Field Hospital. —H. L. Kelley, P. A. Surg. U. S. N."

"Field Hospital, Vera Cruz, May 23, 1914. Re-admitted. Dysentery, bacillary. Origin, duty. Temp. 99.5° F. Painful and frequent stools, tenderness over left iliac region. Blood and many pus cells in stools. No amœbæ. Oleum ricini f℥jss; 2 hours later morphia gr. 1/4 by mouth and bismuth subnitrate gr. x q. 3 hr. Colon irrigations, AgNO 1 : 2000 q. d. *May 25th,* stools less frequent and tenesmus less marked. *27th:* Improving; feels better, and only about eight stools in twenty-four hours. *31st:* Improved. *June 1st:* Complains of slight pain in right hip. *2d:* Pain more severe, urotropin gr. v q. 4 hr. *5th:* Conjunctivitis both eyes; boric acid irrigations and argyrol q. d. *8th:* Conjunctivitis improved, but pain and tenderness in hip about the same. *10th:* Urotropin discontinued and sodium salicylate gr. xv and sodium bicarbonate gr. x, t. i. d. Bowels normal and dysentery well, but patient still rather weak, and has arthritis of the right hip, a sequela of the bacillary dysentery. *17th:* Right hip slightly improved, but some pain and slight swelling of left knee. *20th:* Salicylates discontinued and urotropin gr. v q. 4 hr. begun; knee wrapped in cotton. *25th:* Right hip apparently well, and left knee improved. Temp. 101° F. *29th:* Right knee painful, also right ankle and slight swelling. *July 6th:* Only right knee now tender; rather stiff—patient cannot stand on it. *13th:* Improved; very slight stiffness in right knee. No fever since June 30th.—H. V. Carnett, Asst. Surgeon."

"*July 21st:* To duty, much improved, following Biers hyperemia treatment, and sodium salicylate internally.—L. W. McGuire, P. A. Surgeon."

"Artillery Battalion, Vera Cruz, Mexico, July 21, 1914.—Admitted. Arthritis, acute; right knee. Duty, following dysentery. When patient returned from hospital, he was suffering from some pain and swelling in right knee. This grew worse in spite of treatment, until July 25th, when survey was requested. *July 27:* Surveyed and recommended transfer to U. S. Naval Hospital in United States by first transportation available. Change of climate deemed desirable, since knee is painful and swollen. Right hip and left knee slightly involved. Temperature daily about 99° F. Has lost weight and strength, and is not fit for duty. *Aug. 2d:* No improvement; still has swollen and painful knees. Continue. *8th:* Condition does not change markedly. To be transferred to U. S. S. "Texas" for passage to U. S. in accordance with approved survey.—H. L. Kelley, P. A. Surgeon."

"U. S. S. "Texas," August 8, 1914.—Admitted. Arthritis, acute (right knee). Patient reports this day for transfer to Naval Hospital. Potassium iodid gr. x, t. i. d. *Aug. 21st:* Transferred to Naval Hospital, New York, in accordance with medical survey. Condition remains about the same.—J. B. Dennis, Surgeon."

"U. S. Naval Hospital, New York, N. Y., Aug. 14, 1914.—Admitted. Arthritis, acute. Origin, duty. History as above. On admission both knees swollen, right the worse. Patient feels well; no fever. Prostatic smears negative for gonococci. Wassermann negative. Treatment urotropin and sodium salicylate. *Aug. 25th:* About the same. Wassermann negative. Biers hyperemia treat-

ment in addition. *31st:* Slight improvement. —G. R. FRENCH, P. A. Surgeon."

"*Sept. 10th:* Improving slowly. Right knee still swollen; not painful. Treatment continued. *20th:* Still unable to bear weight on right knee without pain. Knee slightly swollen. No fluid. *28th:* No change.—C. I. WOOD, Asst. Surgeon."

"*Oct. 5th:* About the same. *12th:* Improving slowly.—G. R. W. FRENCH, P. A. Surgeon."

"*Nov. 16:* Improving. *30th:* Has a bad cough which does not respond to treatment. Sputum negative for tubercle bacilli. *Dec. 5th:* Surveyed. Diagnosis and origin as above. Recommended that he be retained for further treatment. *15th:* Survey approved. *Dec. 22d:* Improving. *30th:* Improving. *Jan. 6, 1915:* Repeated examinations of chest and sputum failed to reveal tubercular origin of cough. Cough has greatly improved and arthritis is cured. Patient desires duty and is therefore sent to duty.—J. E. GILL, P. A. Surgeon."

"Approved.—PHILIP LEACH, Med. Director, U. S. Navy, in command."

The patient went to duty at the Marine Barracks, Brooklyn, N. Y., on February 2, 1915, and was transferred to the U. S. S. "Southery," Portsmouth, N. H.

February 15th: Admitted to the sick list on board the "Southery," with the above history, and the statement that his right knee has been swollen and painful ever since his discharge from hospital on January 6, 1915. Upon admission, both knee-joints were swollen, painful, and extremely tender. He also had a severe myositis of the lumbar muscles. Urethra and prostate were normal. A severe and extensive pyorrhea was found, presenting large calcarious deposits upon the necks and roots of all teeth. Temperature 100°. Bed.

Injection of mercuric succinimid gr. 5/5. Referred to dental surgeon for local treatment. *Feb. 17th,* improved, temperature and pulse normal. *20th,* improved. Injection of mercuric succinimid gr. 5/5. *27th,* improved. Injection of mercuric succinimid gr. 5/5. *March 3d,* pyorrhea cured, arthritis nearly so. *6th,* arthritis and myositis cured. Injection of mercuric succinimid gr. 5/5 as a precautionary measure. *14th,* injection of mercuric succinimid gr. 5/5. *15th,* discharged to duty—arthritis, myositis, and pyorrhea cured by five injections, with but twenty-eight sick days, the recognized methods of treatment having failed to cure the condition during two hundred and twenty-one days spent in hospitals and sick-bays. During the four months that have elapsed since his discharge to duty he has been perfectly well. This is the longest period of time by two months that he has spent on duty since his enlistment.

In conclusion, I desire to express my appreciation of the enthusiastic support accorded me by my dental colleague A. A. Dental Surg. Paul G. White, U. S. navy, who first suggested that we cooperate in the application to pyorrhea of my theory in relation to mercury being a cure for all diseases of vegetable parasitic origin, and to whose untiring energy and skilful local surgery so much of the success obtained in these cases has been due.

A NOTE ON THE ETIOLOGY OF PYORRHEA ALVEOLARIS.

By M. R. SMIRNOW, M.D., New Haven, Conn.

FROM THE BACTERIOLOGICAL AND PATHOLOGICAL LABORATORIES OF THE MEDICAL DEPARTMENT, YALE UNIVERSITY.

(Read before the Connecticut State Dental Association, at its annual meeting, held at Hartford, Conn., April 21, 1915.)

THE subject of pyorrhea alveolaris, its probable etiology, and erstwhile discovered *cure* has attracted world-wide attention. The importance of this subject and its relation to the general health more than justifies the great amount of consideration given it by both the medical and dental professions. Indeed, the enthusiasm has been so great as to call forth editorial comment which would tend to place the work of Smith and Barrett as the greatest event in medical science since the discovery of salvarsan. Caution, however, is the keynote that is so well advised in an editorial of the *Journal of the American Medical Association* of February 13th of this year. This note of warning is directed entirely to the word "cure," and emphasizes the fact that temporary and even permanent disappearance of the endamœba does not constitute a cure. It appears to the writer that a second word of caution might also be well worth considering, and that is, from the standpoint of etiology.

CLAIMS FOR AND AGAINST THE PATHOGENICITY OF ENDAMŒBA BUCCALIS.

The presence of the endamœba buccalis was first demonstrated in August 1914 by Barrett in collaboration with A. J. Smith, who also introduced the emetin hydrochlorid method of treatment. This work was followed almost immediately by the report of similar findings by Bass and Johns, who independently had the subject under investigation. Since then several other papers have appeared on pyorrhea alveolaris and its relation to systemic conditions in which the endamœba is also mentioned as the most likely etiological factor. Bass and Johns in their latest paper make emphatic statement that "the specific cause of pyorrhea dentalis and alveolaris is endamœbæ," and that "the pyorrhea results largely from the secondary infection"—bacterial.

The basis for their claim is as follows: (1) The almost constant presence of the endamœba in the pus pockets about the teeth; (2) the endamœbæ are found more numerously nearer the apices of the teeth, whereas the bacteria are nearer to the margin of the gums; (3) the endamœbæ are not found on normal surfaces nor in normal mouths, and (4) pyorrhea is cured and the endamœbæ disappear under daily treatment with emetin hydrochlorid for from three to six successive days.

According to our modern and most exacting requirements, the above observations do not form sufficient basis for the conclusion that the endamœba buccalis is the primary causative agent of pyorrhea. There is no doubt that the endamœba buccalis is present in most cases of pyorrhea, but this alone does not determine it to be the specific and primary etiological factor of the disease.

Chiavaro of Rome, who also isolated the endamœba from pyorrheal pockets and has studied the question carefully, considers this protozoan as non-pathogenic. Craig, who has also studied this

organism extensively, is of the same opinion.

BACTERIA FOUND IN PYORRHEA.

The question of bacterial etiology must also be reckoned with. The presence of different varieties of the streptococcus-pneumococcus group of organisms in pyorrhea is well known to everyone at all interested in this disease. What is their relationship? Is it, as Bass and Johns claim, only a secondary invasion? It appears to the writer that there is no more absolute proof, at the present time, that the primary cause of this infection is endamœbic than that it is bacterial. There is a considerable amount of evidence that may be brought out to support the bacterial side of the question which must be reckoned with before it can be put aside. The organisms already mentioned have been isolated from pyorrhea by Rosenow, Billings, Buerger, Hitchens, Miller, Hartzell, and many others, and form the basis of vaccine therapy in this condition. Organisms of this type can be found in a majority of cases of pyorrhea. They are also found in the so-called pockets in abundance, and in some cases where there is little or no pus, in the depth of the tissues immediately about the roots of the teeth. It has been the experience of the writer to find some form of streptococcus in almost every case of pyorrhea examined. The strain most frequently isolated is the streptococcus viridans, at times a streptococcus hemolyticus, and it may or may not be associated with staphylococci. In several cases there were also found some Gram-positive diphtheroid bacilli, which grow very reluctantly, and on agar appear more like streptococci than bacilli. Another streptococcus found frequently associated with pyorrhea shows a characteristic type of growth. The colony is small, firm, raised, and has a slightly roughened surface, often ivory-like in color. In attempting to pick up the colony, it is found to adhere to the agar quite firmly, so that it can be moved about in its entirety on the surface of the plate. This organism is somewhat pleomorphic, and has been present in so many cases that it is always looked for, and indeed preferred, for the purpose of vaccine therapy.

The fact that streptococci, pneumococci, and occasionally diphtheroid bacilli have been isolated in various forms of arthritis, strengthened by the accepted views of the relation between these forms of arthritis to pyorrhea, would tend to fortify the supposition that pyorrhea has a bacterial etiology.

Aside from the above-mentioned organisms, certain forms of spirilla must likewise be mentioned. Noguchi has isolated from pyorrheal pockets a new species of treponema, the treponema mucosum, which he believes to be closely associated with if it is not the chief etiological factor of this condition. In short, the mere presence of endamœba or bacteria of certain types in this particular condition, where there is such excellent opportunity for the invasion of both of these types of organisms, is not sufficient reason to regard either as the etiological factor.

OBSERVATIONS REGARDING THE RELATIVE LOCATIONS OF ENDAMŒBÆ AND BACTERIA.

In discussing the observation made as to the relative locations of the endamœbæ and bacteria, the former occupying the position deeper in the lesions or pyorrheal pockets, it would appear that here again we can find an explanation other than attaching to it the importance of etiology. It is the inherent quality of the class of protozoa known as the amœbæ to move about and bore into crypts and crevices in search of their nutriment—then why not in the pyorrheal pocket? The endamœba buccalis has indeed been shown by Smith, Middleton, and Barrett, to exist in the crypts of the tonsils, from which they can be extracted by means of capillary pipets. The fact that they are found in the deeper parts of the pocket may be a matter dependent on nutrition, or a more adaptable environment. All at-

tempts at cultivation of the pathogenic amœba of man were made in symbiosis with varieties of bacteria, especially the spirillum of Asiatic cholera. They seem to prefer products of bacterial growth and proteid disintegration. These substances are best found in the deeper portions of the cavities, rather than in the upper part, where they may either be washed away, diluted, or possibly neutralized by the action of the saliva.

The statement that the endamœba buccalis is not found in the normal mouth is refuted by numerous observers. The bone of contention, however, is based upon the interpretations of the supporters of the endamœbic theory that the protozoan in question is of a different and special type from the other forms that may be present in the normal mouth. This question is by no means settled, and is best left for further investigation and possible experimentation for final decision.

THE DEGREE OF SUCCESS OF EMETIN TREATMENT.

Finally, as for the cure of pyorrhea by the use of emetin as a basis of contention, Bass and Johns themselves, though they state that emetin is a perfect endamœbicide—and no doubt it is one of the best, if not the best known to the medical world—report that relapses or reinfection take place in 12 per cent. of treated cases within four weeks. They also report a single case where several courses of emetin failed to rid the patient of the endamœba. The recurrence of the condition is to be expected in many cases irrespective of any particular form of treatment, and is due to the peculiar type of lesion and also to its peculiar location. The destruction of the alveolar periosteum—and what is worse in the more advanced cases, the pericementum—which cannot regenerate, leaves a site of permanent injury more or less open to reinfection. Its location, the oral cavity, which always harbors numerous bacteria and at times, at least, the endamœba, also adds to such a possibility. The word "cure," therefore, verges on a misnomer, and should at least be used with the greatest amount of conservatism. How much importance, then, can be placed upon the relief obtained by the use of emetin in its bearing upon the endamœba as the primary cause of the malady?

THE SUCCESS OF SUCCINIMID OF MERCURY TREATMENT.

Within the past few weeks, Wright and White, of the United States navy, reported uniform and brilliant success ("cures") in twenty-eight consecutive cases by the injection of succinimid of mercury. These cases were treated over periods varying from four to forty-one days, receiving from one to six injections. Systemic complications, such as arthritis, neuralgia, etc., were also present. The treatment was directed entirely against invading bacterial organisms, on the theory that mercury has a chemical affinity for all vegetable parasites. Since the endamœbæ cannot be included in this category of parasites, what becomes of them under this form of treatment? If the endamœba is the primary cause, theoretically the mercurial treatment should be useless, and, *vice versa,* if this method of treatment is all that the writers claim for it, the probabilities are that the endamœba is but a secondary invader. The possibility of mercury succinimid being an endamœbicide must of course not be overlooked. However, the mercurial form of treatment has not yet been verified, so we can bide our time concerning it, recognizing meanwhile its suggestiveness and possible important bearing in the future.

On the other hand, if we are to accept the bacterial theory, in what manner are we to explain the excellent relief seen from the hypodermic use of emetin? Is it possible that this drug is also a germicide, or is the presence of the various forms of bacteria entirely dependent on the presence of the endamœba? The answer is not readily accessible. Emetin

has not been proved an efficient germicide, though that might be possible.* As to the bacteria depending for their existence upon the presence of the endamœba, it would be entirely contrary to all accepted ideas in respect to the interrelation between the two.

THE POSSIBILITY OF BACTERIAL ADAPTATION OR SYMBIOSIS.

The following is merely a suggestion which occurs to the writer, and is offered only as such. Adaptation of the invading organism to the host is well known to the student of infectious diseases. Such adaptation is much more common than would be admitted offhand, and is seen perhaps most strikingly in leprosy. This disease is a chronic granulomatous disease, which clinically at times shows acute exacerbations. One of the very interesting features of this disease is to be seen in the apparent harmonious relation between the invading organism, the bacillus lepræ, and the host. This is evidenced by the occurrence of numerous bacilli within the cells of the granulomatous nodules, which lie dormant within them, but which are ready to strike when opportunity arises—and such opportunity is sure to come. If for some reason or other the resistance of the host is lowered, the harmony and friendship disappear, with consequent destruction of the cell, and results in an acute exacerbation. Later the norm is again reached, active onslaught subsides, and again there is apparent peace and harmony. It is not the intention to place pyorrhea alveolaris alongside of leprosy or in the same category of infectious diseases, for that would be entirely erroneous, though the principle of bacterial adaptation does surely suggest itself.

Pyorrhea is a local and usually chronic disease. At times it may also show acute exacerbations. It may take from a few months to several years for the process to become markedly destructive, with ultimate loss of the involved teeth. In the case of such a slow progressive form of infection, there can be no doubt that the virulence of the organism at fault must be of low grade, and that there is some form of adaptation present between the bacteria and the host. On the one hand, the bacteria, being of low virulence, vegetate slowly, produce toxins, and cause but slight irritation, never enough to call forth a marked reaction on the part of the host. The host, on the other hand, not called upon for special endeavors in combat, reacts sufficiently to maintain this harmony. Such relations are not permanent; with lowered resistance on the part of the host, or through an increase of their virulence, the bacteria suddenly spring into activity, which in turn, through new injury received, spurs the host to greater activity. The injury is directed at a non-regenerating membrane, the pericementum, and as already explained, is more or less permanent and often irreparable, resulting finally in the loss of the teeth. This harmony may also be upset through an increased resistance on the part of the host, in which case the invading organism is the one to suffer the consequences. Under these conditions, the host, aroused from his indifference, is spured on to action, which often results in temporary or permanent disappearance of the invader. The invaders in pyorrhea are both bacterial and endamœbic, and seem to live in harmony with the host and with each other. There is even a suggestion of a true symbiosis existing between the invaders. Barrett and Smith, in a recent communication in *Oral Health,* appear also to be inclined to this form of relationship.

Emetin, whether applied locally or injected hypodermatically, no doubt upsets this relationship, with the destruction primarily of the endamœba. It may be possible that the quantity of emetin may be just sufficient to destroy the low-grade virulent bacteria likewise, but there is no available evidence to support this view. At any rate, the harmony is upset in favor of the host. In the use

* Couret has already reported experiments in which he claims to have obtained germicidal action of emetin against certain bacteria. His work has not been verified.

of either emetin or vaccine treatment, coupled with the local treatment, such as cleansing of the pockets and removal of tartar, the host is given a decided advantage, and a splendid opportunity to rid himself more or less permanently of the evil.

RESULTS OF VACCINE THERAPY INDICATE PRIMARY CAUSE OF INFECTION TO BE BACTERIAL.

If we are to accept the endamœba as the primary factor in the production of this disease, and regard emetin as a specific remedy, how are we to explain the number of striking results obtained by means of vaccine therapy? This is surely a non-specific remedy when directed against the protozoa. The suggestion just given cannot apply, as the vaccine is directed against the supposed secondary invader, the bacteria, and since there is always sufficient nutriment aside from the bacteria and their products to assure a proper environment for the further existence of the endamœba. There can be but little doubt that vaccine therapy emphasizes the fact that the primary cause of the infection is bacterial and not endamœbic.

DATA CONCERNING EXPERIMENTAL PRODUCTION OF PYORRHEA.

There are no data available indicating the experimental production of pyorrhea alveolaris by either bacteria or the endamœba.* It may be of interest to note that pyorrhea, in its typical form, has been observed by the writer in a monkey, the pus present showing numerous streptococci. Plates gave almost a pure culture of the very adherent, somewhat pleomorphic streptococcus described in the first part of this paper. Conditions resembling pyorrhea have been observed by the writer in cats and dogs. Similar observations have been made and reported on by Talbot. Successful results were obtained in at least four of these animals with the use of autogenous vaccines, containing at least one member of the streptococcus group.

Experiments are now under way at the pathological laboratory of the Department of Medicine of Yale University for the production of pyorrhea in cats. It may not be inappropriate to mention at this time that the experiments are encouraging, and that typical pyorrhea has been produced by the writer in one of two carefully selected cats on whom the experiments were first attempted. The lesion up to the eighth day, after local inoculation with three strains of streptococci derived from three different human cases, showed but slight redness. At about the tenth day, the six lower incisors became loose, but no pus was present. Cultures taken from the teeth showed the presence of streptococci similar to those inoculated. Pus was evidenced at about the twenty-first day, and contained streptococci identical with those used for inoculation. It is considered best to leave the details of the method for a future report, in anticipation of further successful results.

In further support of the likelihood that the primary etiological factor in pyorrhea alveolaris is bacterial, the writer desires to present the following cases treated with autogenous vaccines.

CASE HISTORIES INDICATING BACTERIAL ETIOLOGY OF PYORRHEA.

Case I. Miss W., age thirty-six, weight 97 lb. Diagnosis, chronic pyorrhea alveolaris. Pus pockets around all of the teeth, considerable amount of tartar present. Arthritis, left elbow and knee; suffers from "indigestion," poor appetite, tongue coated, breath fetid in character. Secondary anemia present, blood count showed 3,700,000 reds, 10,000 whites, and 75 per cent. hemoglobin.

November 7, 1914. Autogenous vaccine containing streptococcus viridans and the staphylococcus aureus. First injection 100 millions.

Reactions were obtained after most of the injections. At first they were moderate, with slight local redness and pain, and an intense itching sensation about the gums and mouth,

* The attention of the writer has been called by Dr. E. C. Kirk to the fact that Dr. Hecker has reported the experimental production of pyorrhea alveolaris. His work has not yet been consulted.

lasting from twelve to twenty-four hours, often accompanied by headache. Later the reactions became quite mild.

November 15th (third injection). Less pus, improvement in color of patient.

December 12th. Weight of patient 100 lb., splendid general condition, good appetite, arthritis mostly disappeared; teeth tightened, no pus.

December 31st. All pus pockets closed, gums healthy, no trace of arthritis, general health excellent.

January 5th. Patient weighs 105½ lb. General and local conditions normal. Anemia entirely disappeared. Blood count shows 4,800,000 reds, 8,000 whites, and 90 per cent. hemoglobin. Patient was discharged shortly afterward, and has remained in excellent condition to date.

Case II. Mrs. O'D., admitted to St. Raphael's Hospital, February 3, 1912, suffering from fibrous arthritis of both hips, no motion present, patient could not walk; had received internal medication for some time. Patient was anesthetized and the adhesions broken up. Left hospital March 10, 1912, somewhat improved. One month later patient suffering with considerable pain and unable to get about, hips again becoming immobile. Returned to the hospital March 28, 1913, for treatment. Patient in a most miserable condition. Had been bedridden for six weeks prior to her entrance to the hospital, on account of inability to use her legs. Had gastro-intestinal upset with pronounced fetid odor of the breath. Dentist was consulted on account of marked pyorrhea. Two teeth were extracted, the rest thoroughly cleaned. An autogenous vaccine was made containing the streptococcus viridans, the staphylococcus albus, and a diphtheroid bacillus, all obtained from the teeth. Mouth-wash was given of equal parts of hydrogen dioxid and lime-water.

Unusually large doses of vaccine were given, beginning with 200 millions. After each of the first three injections there were marked reactions, with what appeared to be small abscesses at the points of inoculation. These were not treated, but allowed to become absorbed. They did not occur after the third injection, and might be accounted for by the low resisting powers of the patient.

The dosage varied from 200 millions to 3750 millions, which was given on May 14th, nearly six weeks later. There were but slight reactions following each of the subsequent injections.

On April 16th (fourth injection), pus considerably lessened about the teeth. The patient showed slight general improvement and a very little motion at the hips.

April 27th (seventh dose), no pus about teeth, gums assumed pinkish color, fetid breath gone, increased mobility of hips.

May 6th. "There had been a gradual improvement up to date, the pyorrheal condition having entirely disappeared, and a mobility of 15 per cent. in both hips was present. The patient was etherized, and both legs were flexed until all adhesions were broken. Some local inflammation in parts for a few days. On the day when she left the hospital, May 18th, she had 45 per cent. of motion, which increased to 60 per cent. on January 15, 1915. There was no recurrence of either the pyorrhea or the arthritic condition to this time."

Case III. Mr. A. C., teamster, age forty-three, a well-built and well-developed man, was under treatment for pyorrhea in 1912. Several teeth were extracted at this time, the remainder were well cleaned up. Returned to dentist on advice of orthopedist, who was treating him. Diagnosis: Pyorrhea alveolaris with involvement of all of the teeth, several teeth rather loose, the gums were red, swollen and spongy, bled readily. Considerable amount of pus was present. Patient walks with a decided limp, on account of considerable pain in right foot. This foot was put up in a steel brace for the partial removal of weight in walking. Left wrist troublesome. Patient was weak, nervous, and mentally depressed concerning his condition, appetite poor, digestion deranged, and insomnia.

Patient was sent to the writer for consultation and for vaccine therapy if deemed advisable. Vaccine advised, with promise for improving the general condition, but not the involved foot.

Treatment—January 3, 1915. Autogeneous vaccine containing two strains of streptococci, given in rather large doses. Two local applications of emetin were given to get rid of the pus. First injection 200 millions; second, five days later, 300 millions. January 13th, third injection, 500 millions. Reaction followed this dose, and consisted of slight redness and slight swelling. Patient at this time felt much better, able to walk about with greater ease, pus about the teeth was practically gone, and the gums looked much better. January 19th, injected 1000 millions; reaction marked, arm quite red, swollen and painful for twenty-four hours. Within three days patient felt a marked improvement, appetite became very good, insomnia disappeared, no pain in left wrist. Patient walks about with hardly any pain in foot, his mental de-

pression is gone, and he works hard on his truck daily. Patient discharged after four more injections; is in good condition to date.

Case IV. Miss C., age thirty, nurse at the New Haven Hospital. Mouth in extremely bad condition. Dentist extracted two lower lateral incisors on account of lack of support, one molar and one bicuspid on account of abscess. Patient had only six upper and seven lower teeth left, all of which were affected with pyorrhea.

Treatment. Autogenous vaccine, containing the streptococcus viridans and the staphylococcus albus. After two months' treatment the gums became healthy, firm, and of normal color, the remaining teeth tightened and are firm to date, a period of over a year. Plates are now to be made for her.

Case V. Mrs. B. Stubborn case of pyorrhea accompanied by arthritis. Several physicians were interested in this case, and some skepticism was expressed as to the value of vaccines. Autogenous vaccine was finally tried, containing the streptococcus viridans, on February 24, 1915. Local treatment was at first suspended in order to ascertain what the vaccine itself might do. After five injections the pus had almost entirely disappeared, the teeth tightened, the gums were approaching normal, and the arthritis entirely relieved.

Instrumentation was now begun, in order to obtain the best possible effects. Patient is now (April 20) almost entirely well.

CASES OF PYORRHEA OBSERVED AND TREATED IN ANIMALS.

It may be of interest to cite the following cases in animals:

Case I. The writer was asked to see a valuable Persian cat with a view of suggesting some form of treatment for it. The animal was suffering from a mouth condition simulating pyorrhea as seen in the human being. Two teeth had already been extracted, and two others were loose, and considerable pus was seen about these teeth. The mouth was partly open and the saliva, mixed with mucus, flowed freely; the breath had a strong fetid odor. The cat also suffered from an apparent toxic paralysis of the hind legs. To all intents and purposes it was more dead than alive. The suggestion given was the liberal use of chloroform to end its misery. An autogenous vaccine was asked for by the veterinarian in charge, and was furnished, but no hope was entertained as to the success of this form of treatment. The vaccine contained a mixture of streptococcus viridans and the staphylococcus aureus and albus.

It was this case that drew the writer's attention to pyorrhea in animals, and the use of autogenous vaccines as a treatment in these cases.

Local treatment was kept up, as it had been for three weeks previous, by using swabs of antiseptic solutions. The animal also received some form of intestinal antiseptic. The vaccine was given every third or fourth day, beginning with a dose of 50 millions. At the time of the third injection the animal was markedly improved, so much so that it had to be chased about the house in order to receive its treatment. All of the conditions cleared up by the tenth injection of the vaccine. The animal is alive and well today, just two years after treatment.

Case II. A Boston terrier, suffering with a mouth condition simulating pyorrhea, had been treated by several veterinarians without success. By the time the last man was consulted for treatment, the animal was in a very poor state. The gums were inflamed, soggy, and bleeding; there was a slight amount of pus about the teeth principally involved, and a considerable amount of tartar was also present. The animal also had a skin infection evidenced by numerous small superficial abscesses, which were apparently conveyed from place to place by means of scratching or biting. An autogenous vaccine was asked for; it proved very efficient. This vaccine contained two strains of streptococci from the teeth and staphylococcus aureus from the skin lesion. The animal recovered entirely after the twelfth injection. Local instrumentation about the teeth was also employed.

Case III. English bulldog, with infection of the mouth and teeth, very much like pyorrhea. The animal also suffered from a suppurative infection of the left eye. The glands of the neck were quite enlarged. A vaccine of streptococcus viridans and staphylococcus albus obtained from the teeth, combined with a staphylococcus from the infected eye, proved very successful. This animal was treated in 1913, and has remained well since.

PROBABLE LOGICAL COURSE OF EVENTS IN PYORRHEA.

Before closing, it might be well to point out what appears to the writer to

be the more or less logical cycle of events in the course of pyorrhea alveolaris. This condition is, as already stated, a low-grade chronic infection, and like all other infections has its predisposing factors, its specific etiology, and secondary invaders. It also has its own particular pathology and possibly its complications and sequelæ.

The predisposing factors are no doubt both general and local. A general diminished resistance or the presence of some infectious disease, especially one accompanied by some form of stomatitis, will ofttimes predispose to pyorrhea. The relationship between diabetes and pyorrhea has already been pointed out by several observers, who claim that from 25 to 50 per cent. of individuals suffering from diabetes also suffer from pyorrhea.

The local predisposing factors are numerous. Stomatitis, gingivitis, or adjacent inflammations must be considered. Again, malocclusions, faulty dentures, with resultant excessive pressure on certain teeth, sudden strain due to carelessness or thoughtless misuse of the teeth, as in biting hard objects—cracking nuts—and injury, also have their effects. Irritations and possible injuries caused by faulty dental technique is but too frequently a forerunner of pyorrhea. The irritation produced by the accumulation and decay of food materials, taken together with lack of proper care of the teeth and gums, and finally, the constant irritation due to the deposit of tartar about the roots, must also be given their due consideration.

Any of these local predisposing factors may become very aggravating, and cause a non-suppurative form of inflammation, a gingivitis of mild or even of severe form, which, however, does not give the manifestations of a true pyorrhea, and which would tend to return to normal on the removal of the disturbing element. Pyorrhea is primarily characterized by the presence of pus, which practically always indicates bacterial infection. Its pathology is much more serious than that of the simple gingivitis, as it usually entails the destruction of the peridental membrane. With it comes more or less degeneration of the pericementum and often the liberal deposit of lime salts.

A vicious circle is now established. The presence of tartar, through its constant irritation, invites further infection, which in turn causes greater destruction and degenerative changes in the tissues, with further deposit of lime salts.

The relation of the complications and sequelæ of pyorrhea alveolaris is not evident offhand, and might even be regarded as extremely remote, but the relationship between certain forms of arthritis and subacute, infectious endocarditis to pyorrhea is gradually asserting itself, and should be regarded as more than merely suggestive.

SUMMARY.

In summarizing, the following views would seem to be warranted:

(1) There is not sufficient evidence on hand at present to conclude that the endamœba buccalis is the primary etiological factor of pyorrhea alveolaris.

(2) There is as much and possibly more basis for attributing the cause of pyorrhea to bacterial infection, the strepto-pneumococcus group being concerned in particular.

(3) Pyorrhea, or a condition closely simulating it, may be found to occur naturally in cats, dogs, and monkeys, in which organisms are found similar to those found in man.

(4) Though single experiments are not to be relied upon, nevertheless the production of pyorrhea in one of two carefully selected cats by means of streptococci is at least suggestive, and would tend to support the view that these bacteria are concerned in the etiology of pyorrhea alveolaris.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

ENDAMŒBÆ AND EMETIN.

By RUDOLPH C. LIENAU, D.D.S., Brooklyn, N. Y.

SETTING aside all issues as to the etiology, symptomatology, diagnosis, history, etc., and getting down to rock bottom on the endamœba buccalis and the treatment of pyorrhea alveolaris with emetin hydrochlorid, the following facts may be of interest.

Together with Dr. F. E. Niece of New York, bacteriologist and head of the Claremont Laboratories, I have worked on 58 cases of pyorrhea, as follows: Males 34, average age forty-seven; females 24, average age forty-one—excluding two cases of eighteen and twenty years respectively. In all cases I used only Parke, Davis & Co.'s ampules of emetin hydrochlorid, 1 cc. 0.03 gm. (½ gr.). All treatments were given by hypodermatic injection in the shoulder on three successive days. In each and every case, specimens were taken for microscopic examination before *every* injection. Endamœbæ were always found when the case presented itself, and not found after the pus flow had stopped. The flow of pus stopped after using three injections in 50 cases, after four injections in 6 cases, and after six injections in 1 case.

In 1 case pus showed several days after the sixth injection; the patient became despondent and had the tooth, a sound canine, extracted elsewhere.

In no case did any local inflammation or reaction of any consequence appear. Injections were made in a girl of eighteen before going to school, and in a lawyer before going to court. Inflammatory conditions in the mouth subsided remarkably after injections of emetin, and the gums turned pink.

Owing to the microscopic work and the great number of slides examined, my opinion differs from that of Drs. Bass and Johns in that the endamœba is not the *specific* cause of pyorrhea, especially as they acknowledge that pathogenic species of endamœbæ may be found associated with harmless ones. It is my opinion that in future research work, the endamœba will be found to be only a partially causative factor of pyorrhea, and that some other bacterial agent probably exerts just as great an influence. Still, the endamœba may well be called a distinguishing diagnostic feature of pyorrhea. Emetin, absolutely aside from the endamœba, proves greatly beneficial in reducing the inflammation, possibly by its known hemostatic action. It is my further opinion that practicing physicians lack the necessary implements for the local treatment of pyorrhea, and that for the practicing dentist the direct and intelligent use of the microscope, laboratory work, and research become imperative in the successful treatment of pyorrhea alveolaris.

THE RETENTION OF PARTIAL DENTURES.

By ELLISON HILLYER, D.D.S., Sc.D., Brooklyn, N. Y.

(Read before the Connecticut State Dental Association, at its annual meeting, Hartford, April 21, 1915.)

IT is a well-known axiom that "Nothing remains stationary." There must be either progression or retrogression. Our profession of dentistry has exemplified the spirit of progress in varying degrees throughout its entire existence, but never has this spirit been more marked than within the last few years, reaching its maximum within the last few months.

Every branch of the profession is seeking a higher level. Successful operative procedures are not measured by the mere stopping of cavities or relieving pain; restored contours must reproduce the lost parts, anatomically. Inlays of gold and porcelain are receiving much more careful detail attention than formerly. The field of oral surgery is broadening, and with the assistance of improvements in anesthesia and radiography is rapidly advancing to a position which will be well in the forefront of surgery. The services being rendered by the oral surgeon upon the European battlefields is receiving the most commendatory attention. The peculiar nature of the trench warfare has multiplied the cases demanding oral surgery to such an extent that it is almost impossible to cope with the situation. In the face of this, these men are doing operations which are the wonder of the surgical world.

To search for the best methods of treatment of pyorrhea and various focal infections is leading to the closer study of pathological bacteriology, with eminently satisfactory results.

All these efforts, however, are for the preservation of the teeth and the general welfare of the oral cavity. What effect does this have upon the prosthetic field? Even among the uneducated classes of our cities the oral hygiene propaganda has had the effect of awakening the masses to the need of careful conservation of their teeth, and none but the most ignorant will resort to reckless extraction. The development of this education will show its results in years to come by fewer and fewer edentulous cases. The present generation of school children, which is receiving its oral hygiene training and care in our public schools, will carry into their homes and after-lives a greater respect for mouth conditions and their influence upon general systemic health and disease.

There will never, however, be a time when we will be free from the necessity for partial prosthesis. Indeed, as the edentulous conditions decrease, the partial will increase. We have just cause to feel proud of the development of the field of anatomical articulation of teeth in edentulous cases and of the porcelain teeth being provided. Similar opportunity lies open in the proper adaptation of partial restorations.

FIXED BRIDGE WORK.

Primarily, I have never concurred in any attempt to separate crown and bridge work from other forms of partial prosthesis. Restorations are either full or partial. The latter are either fixed or removable. Fixed restorations must necessarily be constructed upon approved principles of hygienic bridge work or fail of accomplishing the end sought. Failure to either understand or apply this is responsible for many of the bridge

dentures which require removal after but a short lifetime of usefulness. Fixed bridges undoubtedly have their place and function, and when properly constructed and discreetly placed fulfil their purpose. It is an indisputable fact that too many and too extensive fixed bridges have been inserted. The general disinclination on the part of the laity toward a removable denture has been largely responsible for this condition. There is coming a time when this will not be the case; patients are beginning to realize that the excessive burdening of anchorage teeth is responsible for the subsequent loss of these teeth, and are seeking some restoration which, while fulfilling the requirements of a fixed denture, will make less burdensome the load upon the supporting teeth. They are also coming to a realizing sense of the increased benefit derived from a denture which will admit of removal for cleansing purposes.

PARTIAL REMOVABLE DENTURES.

Partial removable dentures consist of dentures constructed of the various materials adapted to the special needs of a case. These dentures, whether swaged, cast, or molded, are closely adapted to the form of the model or cast, with the same consideration regarding the relief of the hard areas as is necessary in full dentures. Except in rare cases, plates are assisted in their retention by one of the various gold clasps or special attachments. I emphasize the term "assisted," because the clasps should be used only for that purpose. The ridge and palate portion should be the burden-bearers, with the teeth acting as adjuncts. Not that there should be an overburdening of the ridges, for this has its bad aspect and should be obviated by the construction of a lug or spur upon the occlusal portion of the clasp, according to the plan of Dr. Bonwill.

PLAIN BAND CLASPS.

There are many forms of gold clasps, adaptable to every conceivable need of such a type of denture. The plain band is the simplest, and probably because of that fact is the most universally used. When wisely constructed and shaped it serves its purpose within certain limits. When unwisely adapted, so that undue pressure is exerted upon the long axis of the anchorage tooth, it is certainly a detrimental element rather than an aid in the retention of the denture. The question of the close adaptation of the band to the tooth is still a debated one. Many favor contact upon but one point, facially, leaving a large part of the tooth free for self-cleansing. The need for absolute sanitary care must be impressed upon the patient in every case, and it would seem that such care should result in reasonable freedom from caries.

STANDARD, SCALLOP, AND ELLIOTT WIRE CLASPS.

This desire to afford self-cleansing spaces has resulted in the construction of such clasps as the standard, scallop, and Elliott wire clasps. The standard is constructed as a band clasp around the bulbous portion of the crown, and is supported by either one or two standards which are soldered to the base. The scallop clasp is similar, except that it is formed as an ordinary band clasp with the largest portion of the gingivo-lingual portion scalloped out, the mesial and distal surfaces only being attached to the base. The Elliott clasp is constructed of either a single or double extension of round clasp gold wire, shaped to the desired form, and by virtue of its form touching but slightly on the tooth surface, yet affording secure attachment.

OTHER FORMS OF ATTACHMENT.

The development of the esthetic has tended to exclude the appearance of gold in prosthetic as well as in operative dentistry. This tendency has shown itself in the various forms of attachments which are so constructed as to provide secure anchorage but exclude the appearance of the attachment. The earlier

forms—some of which are retained in principle still—were found in attachments afforded by means of closed-end tubes, provided for split-post insertion. Dr. Litch used this type many years ago. There were also crown anchorages—with dovetail attachments for lug projections. Telescope crowns also had their place.

The Fossume attachment. The introduction of inlays added greatly to the possibilities of this work. Dr. Fossume of New York devised a plan of connecting the abutment teeth by means of various forms of gold wire. These wires were soldered at each end to the abutments, which were either crowns or inlays. The stability thus gained was of great benefit to the anchorage teeth, as the resistance to stress was lessened by the combined strength of the anchorages. A groove, to engage the wire, was swaged on the palatal surface of the denture, allowing it to rest firmly upon the ridge, yet being held securely in its desired position.

The Gilmore and Goslee attachments. This same plan has been further elaborated by both Drs. Gilmore and Goslee. In their methods provision has been made for similar wires and grooves, but small attachments, made of sections of clasp gold half-tubes, are inserted within the grooves at positions favorable for the desired retention. This makes it feasible to insert almost any partial restoration, with no appearance of gold.

Bryant's attachment. A clasp, which retains the characteristic qualities of the band type, yet avoiding the appearance of the gold, is the one devised by Dr. Bryant of Washington. This requires the construction of a crown with mesial and distal perpendicularly parallel grooves. These grooves engage the ends of the clasps, which are formed to fit them. Such an attachment is excellent and gives very fine results.

The Roach attachment. The ball-and-socket attachment invented by Dr. Roach gives a variety of opportunity for application. There is a certain amount of mobility afforded by this method, which in combination with other more rigid attachments makes it applicable for many kinds of partial restorations. These may be made in the various crowns or inlays as abutments.

The Condit attachment. A similar attachment has been devised by Dr. Condit. In this the ball portion is replaced by an open-side tube of clasp gold. A spring clasp is placed in the anchorage to engage the tube attachment inserted in the denture.

Hill's retention device. Another ingenious device is one offered by Dr. Hill. This is constructed with a U-shaped spring inserted into a box attachment. The spring is so shaped as to act similarly to a door-latch. The tip of one end of the U carries a portion of the occlusal restoration of the abutment tooth and is inserted into its position by pressure of the U spring into the box attachment. Here it is held securely until released by the pressure backward of the cusp end, which releases the catch, admitting the removal of the denture.

Rich's dowel crown attachment. The use of dowel crowns to secure partial dentures has been resorted to considerably abroad. On this side of the water one method of this character has been suggested by Dr. Rich, of Saratoga Springs. He has prepared the roots of anchorage teeth with closed-end tubes, fitted to receive the dowels of banded crowns attached to the denture.

Foreign appliances are in use which are combinations of the clasp and bar attachments already mentioned, but which have also a removable dowel crown constructed to act as a separate post for locking purposes.

THE USE OF CASTING.

The opportunities afforded by the casting operations have widened the field to an extent limited only by individual creative ability. Dr. Goslee has given many exceedingly useful ideas for difficult partial restoration. One of these cases is that of the molars missing on one side of the mandible only. To restore such a defect, we may cast bases upon the first and second bicuspids, using replaceable crowns, extending a bar distally which supports a split pin

for each of the two molars. Over these split pins is burnished platinum to form tubes. These tubes are inclosed in a cast saddle bearing the replaceable porcelain molars. When the appliance is cast and the parts have been assembled, the saddle is easily inserted, and is held securely by means of the split pins in the saddle tubes.

These are but a few of the many methods which are at our disposal. We might go on enumerating others, but the general principle involved in the construction of these retention appliances fairly covers the field.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

POCKETS—PYORRHEAL OR OTHERWISE.

By EUGENE S. TALBOT, Chicago, Ill.

NEARLY every writer on the subject of "so-called pyorrhea" has mentioned pus or pyorrheal pockets. Many, in speaking of treatment, scrape away the "dead bone until healthy tissues are reached." I have seen this scraping process continued in the mouth of a young woman of twenty-two years until the apical ends of the six anterior lower teeth were exposed; they then had to be extracted. The sufferings of this young woman while undergoing this operation were terrible. How do these writers know that they are treating "pus pockets"? How do they know that there is "dead bone"?

THE WRITER'S PREVIOUS INVESTIGATIONS.

Strange as it may seem in these enlightened times, none of these writers have investigated the subject to ascertain what the condition of the process is, or where the pus is located. They have simply expressed an opinion which is worthless. It seems to me that the time has now arrived when research work should be taken up to ascertain what actually takes place in the tissues about the teeth when disease is present, and when we should cease filling our literature with worthless guesses. As long ago as 1896, I began to publish my researches, which had been conducted since 1885, upon the tissues about the teeth and jaws, and my reports, in form of both papers and books, are full of original microscopic illustrations showing the nature of the changes, both physiologic and pathologic, from alpha to omega. These studies have been conducted in every conceivable disease, due to local and constitutional irritation and infection, on humans and many different species of animals. The different forms of bone absorption have been discussed and illustrated. This work was censored by the ablest authorities at that time in this country and abroad. This work was published in medical and dental journals as fast as completed. Later, in 1899, it appeared in book form under the title of "Interstitial Gingivitis, or So-called Pyorrhea Alveolaris." In that work the compilation was arranged in the simplest form from the beginning of irritation to inflammation, absorption, abscesses, and the exfoliation of the tooth. There is one grand picture, as well as description, of the entire process.

THREE FORMS OF BONE ABSORPTION.

Why all this work has been ignored and the guessing process still remains popular is beyond comprehension. Certainly, honest research and demonstration is worth more than guesswork, even though it may prove to be faulty later on. Certainly the profession cannot be

classed as readers if they ignore the work of others, especially when it is compiled in book form. In my work upon "Interstitial Gingivitis and Pyorrhea Alveolaris,"* I have described three forms of bone absorption—(*a*) lacunar absorption, (*b*) perforating canal absorption, and (*c*) halisteresis. While lacunar absorption is the most common in the more stable bones of the body, owing to the fact that the alveolar process is a transitory structure and end-organ, halisteresis and perforating canal absorption are the most common in the disappearance of the alveolar process. This is due to the transitory nature of the structure and the violence of the irritation. Lacunar absorption, however, is frequently observed. These methods of bone absorption have been demonstrated in personal observation by preparing specimens of human jaws, those of dogs and cats, monkeys, cows, horses, sheep, guinea-pigs, and other animals. Material was obtained at the stock-yards, in private cat and dog hospitals, at the Chicago pound, dogs roaming the streets, and human jaws were obtained at hospitals and at the morgue.

NATURE OF "POCKETS."

The question might naturally be asked, What are pockets? I would reply that they are spaces between the gum and the root of the tooth, due to irregular absorption of the alveolar process. The absorption of bone is rarely uniform around the root or roots of a tooth. One of the most interesting and simple forms of bone absorption is that which takes place along the sides of the roots of the anterior teeth which have been forcibly wedged either by driving a wooden wedge between them or by forcibly wedging them with separators for the purpose of filling or for correcting an irregularity. The pressure upon the distal sides causes halisteresis. The absorption of the lime salts occurs along the entire length of the root. The balance of the process is comparatively normal. The peridental membrane along this area is also destroyed. This would be called a pocket. When a gold crown is placed upon the root of a tooth, no matter how well it may be adjusted, if it comes in contact with the gum tissue, irritation is set up, and halisteresis results; uniform absorption will follow. Where the process is uniformly absorbed away, it could hardly be called a pocket. On the other hand, if the bone has absorbed unevenly about the tooth, then the deeper cavities might be called pockets. The bone and the trabeculæ have been destroyed, restoration is impossible, and the peridental membrane, losing its function, is also destroyed.

There is another form of bone absorption which is also of great interest in relation to pockets. I refer to perforating canal absorption, which is beautifully illustrated in my work. From a local or constitutional cause, irritation is set up in the coats of the small arteries. From this irritation, whether due to foreign material in the blood or to chemical changes, or both, the bone around the arteries is absorbed away to its entire length. This may be only for a short distance, or it may extend the entire length of the root, from the gum margin to the apical end of the root. The balance of the tooth and roots may be perfectly normal. The peridental membrane along these areas, its function having been lost, is also destroyed. Such a case came into my practice while writing this paper. A man, forty-four years of age, was suffering with intense neuralgia on the right side of the face, extending from the middle of the cheek up to the eye and over the temporal region of the head. The pain was not constant. He suffered more while in bed than at any other time. An examination of his mouth showed the upper right second bicuspid and first molar missing, the upper right second molar being the only tooth left in place. While there was considerable interstitial gingivitis and pyorrhea about the anterior teeth, the gums and process looked perfectly normal about this particular tooth. I used iodin and had the patient call the next day. He suffered con-

* Ransom & Randolph Co., Toledo, Ohio.

siderably that night, but relieved the pain by taking a large roll of cotton saturated with "gum wash" and placing it between the roots of the tooth and the cheek. The pressure and the drug stopped the pain. Upon a second examination, I tapped the teeth and found that the molar did not seem to be so firm as the other teeth. I was able to carry a fine nerve broach to the end of one of the buccal roots without the slightest pain. The bone and peridental membrane along the line of the artery was entirely removed. A drop of cold water on the gum over this root completed the diagnosis. This cavity, then, may be called a "perforating canal pocket" of the finest variety. Such pockets of various sizes and produced by halisteresis, and perforating canals formed in a similar manner, may be found about any or all of the teeth, without a particle of pus being present, as demonstrated by the two illustrations.

EXAGGERATION OF THE GERM THEORY OF DISEASE.

The profession has gone daft on the subject of the germ theory as a cause of disease. If a man drops to the sidewalk from the top of a twenty-story building, he died from a germ disease. If he is burned to death by fire, his taking away was also caused by germs. On the other hand, if a man fell two stories and sustained a compound fracture of the arm or leg and lacerated the soft tissues, or if he escaped from the fire with burns, we would protect the tissues from infection until they are healed; the injuries, however, were not the results of germs. The same condition exists in interstitial gingivitis, with one exception. In the two instances cited, the tissues are restored, while in the last, if deposits remain upon the roots of the tooth or quite an area of the trabeculæ is destroyed, the alveolar process is not restored. Germs were not the cause, although they may be present and infect the tissues after the disease has performed its work.

The arteries are the first to be involved in this disease; the alveolar process is the all-important part, since on it depends the life of the gum tissue and the peridental membrane. Pus infection is always a secondary matter, since the pockets are there, whether the pus is present or not. When free pus is present, it always indicates surface pus; when inclosed, it indicates an abscess. Deposits upon the roots of the teeth will depend upon the area of absorption. Pus and other fluids are the medium through which the absorbed bone is carried and deposited upon the roots of the teeth.

DEAD BONE AND ABSCESSES.

My researches do not show that dead bone is present, the trabeculæ being observed around the bone margins. The absorption indicates a natural physiologic process, since the bone is a transitory structure and an end organ. The illustrations show that pus does not come from dead bone, but from soft fibrous free surface tissue. Halisteresis and perforating canal absorption may begin at any part of the roots of the tooth. Strange as it may seem, poisons in the blood may set up irritation, inflammation, and abscess at any locality. The number of peridental abscesses that can develop, discharge, and absorb away, in many cases without inconvenience to the patient, is wonderful. I have seen as many as twelve in one mouth. In this instance, however, there was considerable pain and soreness when the teeth came together. When the discharge is along the roots of the teeth, they may be considered pus pockets for the time being. The most interesting cases of halisteresis and perforating canal absorption occur in those cases of dead pulps with alveolar abscesses, when the absorption begins at the apical ends of the roots of the teeth. Absorption takes place, an abscess forms on one or all roots, and the entire bone is absorbed away, leaving the trabeculæ in position. The tooth is loose, owing to loss of bone, but when it is to be extracted, as much force is required as though the bone were still about the root.

In the formation of abscesses, either alveolar or peridental, the irritation always produces halisteresis first. After the bone has absorbed away, the abscess walls are made up of the trabeculæ or fibrous tissue. The illustrations all show bone absorption outside of the alveolar walls.

TREATMENT OF POCKETS.

In the treatment of pockets, the less instrumentation used to remove the deposits upon the roots of the teeth the better. There being no dead bone present, the alveolar margins should not be scraped, since they will take care of themselves. All that is necessary is to give nature a chance. Naturally the alveolar process, owing to its transitory nature, is better prepared to take care of itself than any other bone structure in the body. Instrumentation should be limited to avoid infecting the tissues, should pus germs be present. Much pain inflicted by so-called specialists can thus be avoided.

Halisteresis and perforating canal absorption, producing pockets, may occur around any one of the teeth in the mouths of people over thirty years of age. Pus is only present in a very small percentage of patients; since, therefore, there are many pockets without pus, there should be a new classification of the pathology in connection with this disease.

CONTINUOUS GUM COMBINATIONS: AN HISTORICAL SKETCH.

By Dr. LOOMIS P. HASKELL, Chicago, Ill.

HISTORY for the fourth time repeats itself in continuous gum combinations. Soon after the introduction of vulcanite into dental practice, a Chicago dentist, Dr. John C. Fuller, advertised in the papers a new invention called "Combination Work," which was the combination of continuous gum work with vulcanite.

Dr. Allport, editor of the *People's Dental Journal,* wrote to several dentists—Drs. Taft, Roberts, and Goldey—asking if they had ever known of anything of the kind. All replied that they had used it several years before, but had abandoned it as worthless.

Dr. Goldey said he had used it, but soon "found it like the devil's tail painted blue—more ornamental than useful."

Dr. Allport wrote an article upon the subject, showing that it was neither original nor useful, and it was soon given up for two reasons: It was not easy to combine, but more serious was the difficulty of repair, as the vulcanite would have to be destroyed in removing the porcelain, and a new plate made.

Years later, a Detroit dentist sent out circulars announcing that he would come to Chicago to demonstrate his new discovery, the combination aforesaid. I wrote him that he was a back number, whereupon that movement collapsed.

Several years later, a dentist in Ohio announced a new discovery, the vulcanite combination. I pricked that bubble.

Efforts had been made to combine continuous gum with gold, but they failed.

Now comes a new combination of continuous gum and aluminum, by a dentist in Berlin, Dr. Wünsche, who had taken a course in my postgraduate school. (See review in DENTAL COSMOS, February 1915, p. 223.)

The method is complicated and difficult, and the same serious objection remains as to the difficulty of repair, for

the porcelain would have to be removed from the aluminum to which it is cemented.

Of course, at the present time the high cost of platinum makes it difficult for the majority of patients who really need this work because they show the gums. The continuous gum denture remains today the only ideal denture made, the most durable, most artistic, and only absolutely clean denture. Some dentists object to the weight. In my sixty-three years' use of the method I have never found that weight was objectionable. I have models of flat jaws, when these heavy plates are worn, without air-chambers. In fact, I never had patients complain of weight.

As to durability, I have seen a great many sets in wear for twenty-five years and upward, and in several cases for thirty-six, forty, and forty-five years.

NITROUS OXID, OXYGEN, ALONE, IN MIXTURE, AND IN SEQUENCE FOR THE EXTRACTION OPERATION.

By CHARLES K. TETER, D.D.S., Cleveland, Ohio, U.S.A.

(Report presented to Section VIII, Sixth International Dental Congress, London, 1914.)

I WILL not attempt in this report to trace step by step the numerous attempts which have been made to prevent or relieve physical pain in the extraction operation, but will briefly state the development of nitrous oxid as an anesthetic for this purpose.

It was not until the very close of the eighteenth century, namely, 1774, that nitrous oxid was discovered by Priestley. This was the commencement of a new era in chemical physics, and paved the way for the introduction into medical and dental practices of a new, precise, and reliable system for inducing complete unconsciousness, and of retaining this state for a reasonable length of time without any serious or injurious consequences. In 1799 Sir Humphry Davy of England, who at that time was an assistant in the private hospital of Dr. Beddoes, which hospital was established for the treatment of diseases by the inhalation of various vapors or gases, commenced experimenting with nitrous oxid.

The same year he published an account of his researches and experiments made upon himself, in which he describes the exhilarating and intoxicating effects which were produced, and also explained the use which he made of nitrous oxid for relieving the pain incident to toothache and headache. He did not seem to have pushed it to the full extent of insensibility, as he was always conscious of his own sensations, but he carried such inhalations sufficiently far to be perfectly intoxicated and delirious. The reports of his experiments induced many to follow him, and the sincerity of his faith in the non-injurious effect of the gas induced its use all over the world, both for the purpose of amusement and for exhibitions at lectures.

On page 556 of the work of Sir Humphry Davy occurs the following passage: "As nitrous oxid, in its extensive operation, appears capable of destroying physical pain, it may probably be used to advantage during surgical operations in which no great effusion of blood takes place."

The next step in the evolution of nitrous oxid as an anesthetic took place in 1844, when Dr. Horace Wells, a dentist of Hartford, Conn., saw and

took advantage of Davy's predictions regarding the future of nitrous oxid in dental surgery. On December 10, 1844, Dr. Wells attended a lecture given at Hartford, Conn., by G. I. Colton, a public lecturer, whose name later became identified with "laughing-gas" or nitrous oxid. After observing one of these exhibitions, Dr. Wells was so impressed that he was led to remark that a person might have a tooth extracted while under the influence of this gas and not experience any pain.

Mr. Colton was not a dentist nor a physician, although he played an important part in the discovery of general anesthetics. Through his public exhibitions he acquired a valuable experience in administering nitrous oxid. During six months in every year, from 1843 to 1863, he gave daily public exhibitions with laughing-gas for amusement only, usually administering it to twelve or fifteen persons on each occasion.

During this long period, the only anesthetic use of nitrous oxid made by Mr. Colton was in the experiment successfully tried by Horace Wells on December 11, 1844. In June 1863, by solicitation and in connection with Dr. J. A. Smith, a dentist of New Haven, Conn., Colton began the preparation and administration of nitrous oxid on a larger scale, and in that single month of June Dr. Smith extracted 1785 teeth.

This success led Mr. Colton to remove to New York City in July 1863, and with the assistance of Dr. John Allen as dentist he established the Colton Dental Association, which had for its sole object the painless extraction of teeth by nitrous oxid anesthesia. During the first six months of this enterprise no record of patients was kept. From June 1, 1863, to June 1, 1867, however, 18,600 persons were registered, with an average extraction of two and a fraction teeth per patient. In 1866, branches of the association were opened in Philadelphia, Baltimore, St. Louis, Cincinnati, Brooklyn, and Boston. Some of these associations are still in existence.

There have been but few men specializing in the extraction of teeth since 1863, but within the last fifteen years quite a number have taken up this specialty, so that today we have extracting specialists in all the large cities of America.

In order that we might secure accurate data in regard to the extent to which nitrous oxid is being used by specialists in extracting teeth, and further for the purpose of establishing reliable statistics, I recently addressed a series of questions to over 150 extracting specialists in the United States and Canada, and beg here to give the answers to such inquiries.

Questions.

Q. To what extent do you employ nitrous oxid in your extracting operations?

A. Averages from 95 to 98 per cent.

Q. Do you administer the nitrous oxid alone to induce anesthesia?

A. Fifty per cent. said yes.

Q. Do you induce anesthesia with nitrous oxid and air?

A. Fifty per cent. said yes.

Q. Do you induce anesthesia with nitrous oxid and oxygen?

A. Fifty per cent. said yes.

Q. Do you employ the face inhaler alone?

A. One-third do.

Q. Do you employ the face inhaler to induce anesthesia, and continue anesthesia by means of the nasal inhaler?

A. One-third do.

Q. Do you employ the nasal inhaler to induce anesthesia?

A. About forty per cent. do.

Q. Do you continue anesthesia to the completion of the operation with the nasal inhaler?

A. Yes.

Q. Do you supplement the nitrous oxid with ether?

A. Very rarely.

Q. Do you supplement the nitrous oxid with chloroform?

A. No.

Q. Do you supplement the nitrous oxid with somnoform?

A. No.

Q. What percentage of nausea do you have following momentary operations with nitrous oxid alone?

A. About two per cent.

Q. What percentage of nausea do you have following momentary operations with nitrous oxid and air?

A. About three per cent.

Q. What percentage of nausea do you have following momentary operations with nitrous oxid and oxygen?

A. About two per cent.

Q. What percentage of nausea do you have with nitrous oxid and air in prolonged operations of extraction?

A. About five per cent.

Q. What percentage of nausea do you have with nitrous oxid and oxygen in prolonged operations of extraction?

A. About five per cent.

Q. Have you had any cases of temporary insanity following anesthesia? If so, how many?

A. Nine cases reported, one case being a cocain user, two cases being alcoholics.

Q. Have you had any case that remained unconscious unduly long after the discontinuance of the anesthetic? If so, how long did they remain unconscious?

A. About twenty cases from five to ten minutes—two cases reported of one half-hour, one case of an hour, and one case of three hours.

Q. How many times have you administered nitrous oxid alone?

A. Total, 938,924.

Q. How many times have you administered nitrous oxid with air?

A. Total, 32,172.

Q. How many times have you administered nitrous oxid with oxygen?

A. Total, 190,724.

Q. Have you had any fatalities? If so, how many?

A. Total, two cases.

Q. Do you use local anesthesia and to what extent as compared with the nitrous oxid, either alone or in combination with air or oxygen?

A. About two and one-half per cent.

Q. What local anesthetic do you employ?

A. Majority use novocain.

Q. What are your objections to the use of nitrous oxid, either alone, with air, or with oxygen, in the extraction operation?

A. All objected to nitrous oxid alone, because of the shortness of available anesthesia. No objections to nitrous oxid and oxygen.

The low mortality rate as shown above is almost unbelievable, and can only be accounted for from the fact that all of these specialists were fairly experienced in the handling of nitrous oxid as the anesthetic for short operations. There have been some fatal cases in America due to nitrous oxid. These fatalities have taken place in dental offices where the administrator had but little experience. I have been able to obtain the details in but three of these cases.

I wish to impress upon the minds of all the fact that continued cyanosis is a great element of danger. The fact that a large number of men are continuing anesthesia to the completion of the extraction operation, regardless of the time consumed, is bound to greatly increase the rate of mortality unless the anesthesia be void of asphyxial manifestations. Momentary asphyxia has been proved to be comparatively safe; prolonged asphyxia is alarmingly dangerous.

USE OF PURE OXYGEN.

Dr. Horace Andrews of Chicago, in 1868, was the first to call attention to the fact that better anesthesia could be obtained when using pure oxygen with nitrous oxid in place of the atmospheric air.

It is necessary to administer nitrous oxid from 80 to 90 per cent. pure in order that the blood may become sufficiently saturated to produce the anesthetic state. This being true, there is not enough oxygen available from the atmosphere, in the majority of cases, to make nitrous oxid respirable, owing to the large percentage of nitrogen in the atmosphere. The average patient, for example, will require eighty-eight parts of nitrous oxid to produce a satisfactory anesthesia, which will leave twelve parts of atmospheric air. As the air contains but about one-fifth of oxygen, there would be only about two and two-fifths parts of oxygen available. Nitrous oxid is not continuously respirable with less than twelve parts of pure oxygen.

Another very essential principle involved in the scientific administration of nitrous oxid and oxygen is the maintenance of a definite and even flow of both the nitrous oxid and oxygen. I

have called attention to the necessity of precision and accuracy of dosage many times, as I consider them as the most essential points in producing and maintaining a safe and satisfactory anesthesia.

With a definite, even flow of the gases, it is comparatively easy to anesthetize successfully the majority of patients. When the anesthetic tension in the blood and other tissues in the body has been established, and the proper proportions of the nitrous oxid and oxygen arrived at that will control the individual case, it will not be necessary to change the proportions of the gases to any great extent throughout any extracting operation.

TECHNIQUE OF ADMINISTRATION.

I will now give you the technique of administering nitrous oxid and oxygen for the extraction of a large number of teeth. This technique, I think, is rapidly becoming universally adopted in America.

The patient should be prepared in that he should not have had solid food for at least five or six hours before the anesthetic is administered. If only a few teeth are to be removed this does not apply. The bladder should be emptied, as embarrassing conditions are sure to arise unless this matter receives attention. Tight collars should be removed and neck bands loosened. The confidence of the patient should of course be gained, the influence beginning as soon as the patient meets the assistant.

The patient should take a comfortable position in the chair. The head should be held in a straight line with the body, care being taken not to put it too far back or too far forward. Either position will tend to obstruct respiration. The nasal inhaler is used in all these operations unless there be complete nasal obstruction, in which event it will be necessary to place the nasal inhaler over the mouth until anesthesia has been established. Then place it over the nose, and you will be able to force a sufficient volume of gas through the nose to continue the narcosis. You may be aided greatly by the use of surgical sponges in the mouth. Having the patient in the proper position in the chair, the nasal inhaler is adjusted over the nose, using the thumbs to spread the lower part of the rubber hood in order to prevent the partial obstruction of the nasal passage. The nitrous oxid is allowed to flow at the rate of about 150 gallons per hour. The patient is instructed to take rather long but not too deep inhalations. At the same time the oxygen is allowed to flow at the rate of about 15 gallons per hour. The oxygen bag should have been filled before the administration commenced. It will be necessary, as a rule, to increase the amount of oxygen after the first three or four inhalations, to about 20 gallons per hour, as the condition of the patient may indicate.

The patient will pass into the anesthetic state in from one to two minutes. The mouth-prop is inserted after the adjustment of the inhaler. The mouth now being open, the patient is instructed to breathe through the nose, relax, and go to sleep.

If mouth-breathing be noticed and persisted in after directions to breathe properly, place at once a piece of rubber over the mouth, which will compel proper breathing, carrying the patient to the required depth of anesthesia. Now remove the rubber from the mouth. Should the patient then commence to breathe through the mouth, the exhalation valve on the inhaler should be closed, and the nitrous oxid and oxygen forced more rapidly. The inhaler is held firmly over the nose and the gases forced through the nasal passages under sufficient pressure to exclude the atmospheric air. The patient is then compelled to receive the gases into the lungs, even though he be inhaling and exhaling through the mouth. This is known as pharyngeal-insufflation anesthesia. Less oxygen may be necessary under these conditions than would be the case if the patient breathed continuously through the nose, because a certain amount of air gains entrance.

The mouth-breathing can be controlled to a certain extent by using surgical sponges. These sponges are used for taking care of the blood. One or more may be packed in the back of the mouth, thus compelling, to a certain extent, nasal breathing. I have found these to be a great help in work of this kind. They also serve another purpose, which is one of great advantage and safety; that is, they prevent the flow of blood into the throat, and also prevent the accidental entrance of a tooth into the throat. A few such accidents have been reported with very serious results. Care must be taken not to pack them too far back, because they will shut off the opening into the nostrils, and the patient will therefore not receive the gases. This will cause complete obstruction in breathing as well.

By continually forcing the nitrous oxid and controlling the asphyxial manifestations with the oxygen, the patient can be successfully kept under the anesthetic as long as may be required to accomplish the work well. Should the patient continue to breathe through the nose and not through the mouth, it will not be necessary to allow the nitrous oxid to flow faster than about 150 gallons per hour and the oxygen 20 to 25 gallons per hour. In the majority of cases these proportions will carry the patients along in a quiet anesthesia. Unfortunately, however, cases will be met with when one's resources will be taxed to the utmost in order to anesthetize the patients successfully.

You will have patients, perhaps, who will have extremely nervous temperaments and will be very much frightened. It is a peculiar fact that even the average patient is much more frightened when he sits down in the dental chair to have a tooth extracted than he is when he comes to the operating room for an operation. He has not had the preliminary preparation that he should receive before the operation, and he is therefore in a higher state of nervous tension.

The alcoholics, the strong vigorous man, the excessive smoker, are one and all hard to anesthetize with nitrous oxid and oxygen. It is out of the question to obtain a quiet, profound anesthesia in such cases. These cases can, however, be anesthetized successfully, and all dental extractions can be done painlessly without preliminary narcotics, if attention be paid to every detail, and sufficient time be taken to put them well under. All atmospheric air must be eliminated, and a rather small amount of oxygen used at first, just enough to prevent asphyxial spasms of the muscles, etc. It is impossible to induce anesthesia in these cases if the patient be kept in a pink condition, for more or less cyanosis is essential during the induction, but as a rule this may be cleared up to a considerable extent as anesthesia progresses. It is not unusual to consume from three to four minutes in putting such patients under. Mouth-breathing must be guarded against, not only during the induction, but also during the work in the mouth.

It is necessary to have an assistant trained in this work, for it is out of the question for a man to expect to administer the anesthetic and do the operating work at the same time. Analgesia but not anesthesia may be controlled without an assistant.

The inhaler should be held so that perfect coaptation is secured at all times. The assistant may control the proportions of the gases as instructed by the operator. No word should be spoken during the induction of anesthesia excepting when directed to the patient. The only person to talk at this time should be the operator. What he says should depend upon the temperament of the patient, since he is anxious at this time for encouragement and assurance.

Tell him to breathe naturally, but not too deeply; to relax and try to go to sleep. Assure him that it is not unpleasant or dangerous and that he will feel nothing. Assure him you will watch him closely and that everything will be all right. Your patient will probably be unconscious within fifteen or twenty seconds, so you do not have to keep this talk up very long. If he

resist at all, be firm with him, and impress upon him the fact that he is only adding to his own discomfort. Do not force an adult to take the anesthetic if he will not do as you tell him. It is far better to dismiss him. Tell him you will gladly administer the anesthetic when he has made up his mind to come in and do as you say. He will return at some later time and give you no trouble.

The laws of most countries are very strict in this matter, and you dare not hold an adult patient and force him to take the anesthetic. However, if he be under the anesthetic to the extent that he does not have control of his mental faculties and then resists, you are at liberty to hold and put him under. A child, who has been brought by its parent or guardian may be forcibly held, but not an adult of sound mind.

It is always best to have friends of the patient out of the room when administering the anesthetic, as they cannot help any, but can be a great hindrance. At times they require more assurance and attention than the patient himself, and it is not fair to the patient to have the operator's attention diverted from him and the work in hand. If the friend be permitted to remain, you will have, as a rule, a perfectly satisfied patient but a horrified friend, as he will be as loud in his denunciations of it as the patient will be in the appreciation of it. Therefore if you wish to have success, a satisfied patient, and favorable comment, keep the friends out of the operating room.

Nitrous oxid has been the anesthetic of choice for the extraction operation since its discovery. It is being used today to a greater extent than ever before, because, first, the dangers of nitrous oxid are technical only, while the dangers from all other anesthetic agents are pathological as well as technical; second, because of the greatly improved apparatus, perfected technique, and increased knowledge and experience that have been gained in the last sixty years.

CORRESPONDENCE.

A SKEPTIC REGARDING PYORRHEA CURES.

To the Editor of the Dental Cosmos:

Sir,—What next in the treatment of pyorrhea alveolaris?

So many "sure cures" for this distressing malady have been exploded in the past two or three years that the public are becoming a bit gun-shy. Aside from the fact that a little experience has been gained by my failures, a few rays of light have been shed by these explosions.

The first grenade I know of was Dr. Head's *tartar solvent,* which after many diligent attempts was soon discarded.

The *vaccine treatment* came fast on the heels of the tartar solvent, tarried awhile, then traveled the path of its predecessor. I went into this treatment very assiduously, and concluded after many trials that the small percentage of cures and the difficulty of administration blighted the sanguine hope I held for this remedy.

The vaccine treatment for pyorrhea, like Friedmann's cure for tuberculosis, was heralded as a positive remedy, but when brought before the great judge, Time, it was pronounced worthless for lack of evidence, notwithstanding the fact that Dr. Medalia of Boston, who experimented much in this field, prefers this method to emetin.

Today we have reached the stage of the *emetin hydrochlorid* treatment, and the good that has been obtained so far is remarkable and encouraging. But let us not be too enthusiastic, until Time has passed judgment, otherwise the public will accept nothing in the future that the dentist may suggest to relieve pyorrhea.

One of the most difficult problems that confront the dentist in this treatment is the ability to differentiate between how much the emetin accomplishes and how much instrumentation accomplishes independently of each other. I was told by a reputable dentist that Dr. Bass of Tulane University had told him that emetin without instrumentation would effect a cure. This does not seem possible. I heard Dr. Bass speak on this subject, and the one feature that struck me forcibly was his utter disregard for instrumentation; he made no reference to it whatever, although he did make some little mention of it in his article published in the *Journal of the American Medical Association.*

A dentist in my city expressed the opinion that all or nearly all of the improvement noted in his cases was due to instrumentation.

A decided improvement over the injection of emetin hydrochlorid is the treatment with Alcresta ipecac tablets by the mouth, which yields the same effect.

Dr. Eugene S. Talbot says in his work on "Interstitial Gingivitis" that Dr. C. E. Sayre and Dr. A. E. Flower, two practitioners of comparative medicine, when consulted as to the frequency of this disease in animals, said that eighty per cent. of dogs over eight years had pyorrhea. Dr. Bass said in one of his lectures that dogs were not subject to this disease.

In April 10th issue of the *Journal of the American Medical Association* appeared an article by Drs. Wright and White of the navy, giving twenty-eight cases of pyorrhea that were treated with injections of *mercuric succinimid,* and all of which were completely cured in a remarkably short period of time. Will this drug supplant emetin?

Yours truly,

F. P. Kehoe.

Savannah, Ga.

PROCEEDINGS OF SOCIETIES.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

Forty-seventh Annual Meeting.

(Continued from page 934.)

THURSDAY—*Evening Session.*

The meeting was called to order Thursday evening, May 13th, at 8 o'clock, by the president, Dr. Wright.

The President read a letter from Dr. R. W. Bunting, Ann Arbor, Mich., expressing his regrets at being unable to attend the meeting and to take part in the discussion of Dr. Hopewell-Smith's paper.

The President announced as the first item on the program for the evening session the reading of a paper by Professor A. HOPEWELL-SMITH, Philadelphia, Pa., entitled "Concerning the Production of Dental Caries."

[This paper is printed in full at page 990 of the present issue of the COSMOS.]

Discussion.

Dr. W. B. DUNNING, New York. In discussing Dr. Hopewell-Smith's valuable paper, I shall speak from the viewpoint of the practitioner, and not from that of the chemist or biological expert. I profess to little competence in the technical procedures of the biological laboratory, which form so vital a part of the research into the great problem of the causation of dental caries.

Under the heading of "Facts," Dr. Hopewell-Smith states that "dental caries is characterized by a partial destruction of Nasmyth's membrane," and later, that "It is probably correct that the enamel cuticle when intact is a potent factor in the prevention of the attacks of dental caries." I am doubtless not in touch with the latest knowledge concerning Nasmyth's membrane, but I have never understood that that structure was other than the peripheral remnant of the enamel organ, its function having been fulfilled prior to the eruption of the tooth, and that upon eruption, this dead film of epithelial cells is soon removed by the friction of mastication. Possibly other members of this society have a similar notion concerning the nature and function of Nasmyth's membrane, and we should be interested in having the latest word thereon from our essayist.

The observations concerning bacterial life in the "gingival trough" are very interesting, but in the maze of factors to be considered in any given case, it would seem almost impossible to determine the true significance of their presence as bearing upon the fact of the relative immunity to caries of tooth structure in that region. It would be difficult indeed to prove a distinct antibiotic action on the part of such organisms as are found therein, upon caries-producing organisms. May not an equally plausible explanation be that the gingival exudate possesses such inhibitory power? Pickerill's estimation that several million possible combinations of oral factors enter into caries production or inhibition well serves to impress upon us the magnitude of the task set for our investigators. Probably the future will bring more prominently into view the

influence of the internal secretions upon tooth formation, upon insufficiency in tooth structure, and upon detrimental predisposition caused by injury to the thyroid, parathyroid, and other glands. Possibly it may be found that the intricate external—or oral—powers of offense and defense are really dominated by these deeper influences controlling growth and the integrity of tooth structure. This would seem a justifiable surmise, based upon the well-known general principle that the state of the internal vitality of organs determines the susceptibility or immunity to the ever-present bacterial hosts awaiting conquest.

Be this as it may, and until we have devised better preventive means, our labors in the direction of oral *mechanical* cleanliness is surely an important prophylactic measure. I emphasize mechanical cleanliness, and fully agree with the essayist in doubting the wisdom of the use of mouth antiseptics.

Dr. F. W. Low, Buffalo. I would like to ask Dr. Hopewell-Smith to explain to us in his closing remarks why he found tartaric acid better than hydrochloric for the alkaline acid test, and what detective he used. Was it methyl orange or some other substance that he used in connection with the acid?

Dr. Hopewell-Smith. Litmus was used in connection with the acid test.

Dr. Low. We have thought that litmus was rather unreliable in connection with hydrochloric acid, and I would like the essayist to explain why he used tartaric acid?

Dr. Hopewell-Smith (closing the discussion). I think I have gotten off very lightly. It is not an easy matter to answer offhand questions asked in a discussion. I know that I have not left many loopholes for discussion, but I was very glad to hear what Dr. Dunning said about the paper. He spoke of the function of Nasmyth's membrane. Nasmyth's membrane is a very important organ, in fact it is so important, to my mind, that in teaching my class at the University of Pennsylvania, I take up this subject as the first line of advance in regard to the study of dental caries. Nasmyth's membrane, as I have said, persists throughout life. I have found it over the teeth of patients as old as seventy years. It does not exist entire, but it is present in every instance, and one can easily demonstrate that fact by placing an extracted tooth in a ten per cent. solution of hydrochloric acid, when almost immediately the membrane can be peeled off. It can be seen in preparations for microscopical examination, and consists of two parts, of which the outer layer is cellular, while the inner layer is laminated, and quite thick, I think at least fifty microns. It is Nasmyth's membrane which takes the stain found so commonly in children's mouths, which we call green stain; that is a stain on the membrane, not on the enamel.

Dr. Dunning. May I ask whether the use of pumice in polishing the teeth has any effect in removing the membrane?

Dr. Hopewell-Smith. I should say that it has.

Dr. Dunning. Then patients who have had their teeth polished year after year must have lost that membrane.

Dr. Hopewell-Smith. That would be possible, of course, but pumice is a bad thing for the teeth.

With regard to the contents of the gingival trough, I am not aware that there is any exudate; there is dead epithelial tissue, and, of course, saliva and its organisms, but no real so-called exudate existing in the trough, so far as I know. I am extremely glad that Dr. Dunning agreed with me in the fact that mechanical cleansing is more important than any antiseptic remedies.

Dr. Low asks why I used tartaric acid in testing for alkalinity, and also why litmus was used. This is the usual laboratory method. I have found hydrochloric acid to be destructive in these tests, and one uses litmus under the modern laboratory methods of practice, although I agree with Dr. Low that it is not a very efficient test. The apparatus used was one especially designed for testing the alkalinity of the blood, but I used tartaric acid because it is the recognized reagent for testing any fluids of the body.

The President announced as the next order of the program, the reading of a paper by Dr. W. A. Capon, Philadelphia, Pa., entitled "Some Advantages of Jacket Crowns."

[This paper is printed in full at page 965 of the present issue of the COSMOS.]

Discussion.

Dr. W. D. TRACY, New York. The essayist's subject is an exceedingly vital one, and presents many different phases. The jacket crown, I believe, is an appliance the merits of which have not been sufficiently recognized, but it seems to me that it has a good many limitations. Dr. Capon says that any man of average ability with little effort and time should be able to make a jacket crown, but I think the operators who are successful in handling porcelain are men to whom this kind of crown most naturally appeals, and I know a great many who have conscientiously tried to use porcelain without satisfactory results. The technique of porcelain work, in my opinion, requires constant application and long experience before it can be perfected, which is one of its limitations. The field of application of this appliance, as shown by the essayist's pictures, is very wide. There has been some question in my mind in the last few years as to whether I have been doing the right and proper thing in placing jacket crowns on teeth with vital pulps. Dr. Capon, whom I have known very pleasantly for many years, however, assures me that there will never be any trouble from covering vital teeth with jacket crowns. Some of my New York friends tell me that they have not for a number of years put any kind of crown over a vital tooth, for the reason that, when a vital tooth is covered and the natural influence of the fluids of the mouth is shut off from the tooth, it is placed in an abnormal condition and will undergo retrograde changes, and eventually, even though the patient may not know it, histological changes that will result in disease conditions. This I believe to be true if the tooth has been ground down very much. Teeth which have been liberally ground and then crowned are apt to suffer histological changes of the pulp, but Dr. Capon's method requires little radical grinding. It is quite likely, however, that in his practice conditions may be different from what they are in mine, because the technique which I have employed has always included the stripping of the enamel periphery of the tooth, leaving a well-defined shoulder at the free margin of the gum. In my early efforts I tried to go under the gum, but I found that this was unnecessary, or rather was detrimental to the gingival margin, as the gum tissue would not take kindly to the crown.

With regard to the overlap crown, I realize that in some cases this would be serviceable, and might help the operator out of certain problematic troubles in dealing with eroded or abraded teeth. In crowning such teeth strength on the lingual aspect is required, and the retaining groove enables the operator to make a nice restoration, but I have had no experience with that form of crown. I would like to have Dr. Capon express himself in regard to the clinical observation of teeth crowned in this manner, and to state whether there are many instances where he has to open through the crown to take care of devitalized pulps. I have had little trouble in opening through jacket crowns. Some of my friends contend that the radiograph would undoubtedly show pulpal changes to be due to placing jacket crowns over living pulps. In consideration of the light of the more recent knowledge of asepsis, and a little closer understanding of the delicate organism of the pulp and its disturbances, I have been promising myself, when I shall have the opportunity, to make some radiographs of crowned teeth which have been in the mouth eight or ten years, to note the condition of their pulps.

We are all familiar, of course, with the superior character of Dr. Capon's work, and I presume no one has made a more careful study or has been more successful in the universal application of this work in complicated cases.

Dr. G. H. Butler, Syracuse. In regard to the jacket crown, if I could do this work, perhaps I would like it better. Dr. Tracy has said so nearly what I had in mind as to the behavior of the pulp under these crowns, and said it so much better than I could, that I can only indorse his statement.

In the average cases, it seems to me, if there is enough tooth substance left to hold the crown, that it will be bulky and too prominent, and, if enough of the tooth structure is cut away to give strength to the porcelain, it will be at the risk of permanence. I have always worked upon the principle that there is little value in a band without a pin. I leave as much tooth substance on the buccal portion of the tooth as possible, and for that reason I appreciate the advantages of the jacket crown.

The essayist's special cases are all very interesting to us, and while looking at his pictures I thought of one case that I had to deal with in which conditions were somewhat the same as shown in one of the pictures. In this case a bridge was fastened to a second molar and a canine. The molar was fairly loose, but I had reason to believe that one of its buccal roots was healthy. I therefore cut the tooth in two and extracted the other two roots, leaving a fairly good, solid root upon which I tried to anchor a bridge. This was done over two years ago. When I saw the case only a few days ago, the bridge was still solid, and the gums were perfectly healthy around the single root.

As for fastening bridges to open bands around bicuspids and canines for putting in a first bicuspid, with a bar running from one of the incisors back of the canine or even back of the lateral and canine, I think this to be very poor practice. In order to avoid the use of fused porcelain, and still have strength, in cases where there is a long enough bite I have had a good deal of satisfaction in using Logan crowns with bands. I am a believer in bands, but they must not go very far under the gum and must fit the root, and, from an experience of thirty years, I know that bands can be made to go under the gums without causing irritation. If an operator has no furnace and cannot bake porcelain for these long-bite cases, and still wants strength without wishing to have any gold showing, he may derive great satisfaction from using the Logan crown, grinding out a hollow place so that platinum can be burnished in the recess clear to the pin, and when that is filled with solder, an attachment is obtained not only to the pin but to the band, and a very good abutment for a bridge is secured.

We sometimes have adult patients in whose mouth a single tooth begins to protrude considerably. Age, of course, precludes orthodontia treatment, but I have had satisfaction in making in such cases a Jackson appliance with a finger spring that will slip over the front of the tooth to hold it. I have patients wear this appliance at night only, thereby preventing protrusion of the tooth and the unsightliness of such a condition.

Dr. L. A. Timerman, Fort Plain. I am very glad indeed to learn the possibilities of this kind of work. It is truly a surprise to me that such work can be done so beautifully and permanently. We have reached the day of specialism in dentistry, and I do not believe that the general practitioner can do this work successfully. A number of years ago I took up this work and tried to get results, but I have never been pleased with my porcelain work, and have decided that I must be one of the men Dr. Tracy spoke of, who lack the ability to use porcelain. I was really surprised to see such restorations and to know that they are so durable as to last for twenty years. I have seen a number of these crowns, but felt that they were weak and could only be used in cases of delicate people who did not expect to use their teeth very strenuously. In the case shown by the essayist in which the crowns have lasted twenty-three years, I would like to know how the color of these crowns compares with the natural teeth?

Dr. Capon. There was not much

chance of change, because all the anterior teeth were crowned.

Dr. C. K. Buell, Buffalo. I have had some experience with porcelain jacket crowns, but very little with the class which Dr. Capon calls the first type, because as soon as I learned of the second type, I discarded the first type for the reason that the first type possesses the imperfection of the platinum lining back of it, and I could make a crown of the second type that in my estimation was stronger than one of the first type. The third type I have had no experience with whatever.

I can give testimony after fifteen years' experience in placing a great many of them, and I can recall but two cases in which I have had any trouble with the pulp, and in either case I could not attribute the trouble to the crown. The one case was that of a young boy who, in cranking his father's automobile, was struck by the crank in the face, fracturing one of his teeth. It was three weeks before I saw the case. The pulp then responded, but after the crown had been on the tooth for about four weeks, the pulp died. I had very little trouble in going through the porcelain to remove the pulp—it was as easy as it would have been to penetrate normal enamel. The other case was that of a boy who in skating fell on the ice, receiving a very severe blow which broke off one of his teeth. The tooth was not only broken off, but loosened in its socket. The case was treated for some time before the boy came into my hands for the final crowning of the tooth, and the pulp died after the crown was placed. Those are the only two cases I have had any trouble with.

The use of crowns of the first type as abutments has never appealed to me. I have always felt that a bridge should have an abutment which would be more secure than an abutment of this class, moreover, in case of fracture, a repair is fairly difficult. In one of my patients twelve of the crowns of the second type have been in the mouth for nearly eleven years, and last summer I had an X-ray taken, and so far as we could discover, the pulps of these teeth had undergone no change.

With reference to lasting quality, I do not think that there is any crown that we can place upon any tooth that is stronger than the porcelain shell crown.

Dr. George Evans, New York. I have been acquainted with Dr. Capon for many years. Some twelve or thirteen years ago, when I was chairman of the clinic committee of the First District Dental Society, I invited Dr. Capon to come to the district meeting and demonstrate to us this specialty, because I was aware of the fact that the profession as a whole was not acquainted with his ability in this line of work. Dr. Capon at that time demonstrated almost the same topic as he has shown tonight, but a good many operators who saw his work at that time seem to have forgotten that such work was ever done. I have seen this work and I can testify to the truthfulness of all the statements that have been made this evening.

At the dedication exercises of the Evans Institute, I had the opportunity to see the work which the essayist presented on that occasion, and can therefore testify to the correctness of his contentions. There is one point, however, which I would like to have Dr. Capon discuss, namely, the use of platinum. Collars are made today largely of coin gold, which contains ten per cent. copper and oxidizes under the gum margins. In mouths with acid saliva it oxidizes considerably, and acts as an irritant.

Now, what have we as a substitute? Platinum is the only metal that should go under the gum margin to any extent in acid mouths, especially in cases of pyorrhea. Even gold crowns should be made so that the portion extending under the gum margin is platinum. I have made such crowns for twenty-five years, and I have some specimens that I made to show the students of the Baltimore College when I lectured there twenty-five years ago. In these crowns the collar section is made of platinum and the other portion is built of gold and porcelain as in ordinary crowns. Platinum under the gum margin resists

the action of the fluids of the mouth better than all other metals, is next to porcelain, and the secret of Dr. Capon's success rests in the fact that, by the use of platinum and porcelain, he avoids that irritation at the gingival margin more or less of which is present in all gold work.

A woman patient of mine presented herself at my office the other day in whose mouth I had placed two central incisor crowns made with platinum collars, twenty-five years ago, the natural teeth having been broken off in an accident. I made these crowns with platinum collars, and today the absorption around the gingival margin is hardly perceptible; but if these collars had been made of coin gold the gingiva would probably be above the margin of the collar. Dr. Capon obtains similar results in his porcelain work.

The fear of pulps dying under crowns need not worry us a great deal. Once in a while pulps die under crowns, but the proportion of these is no greater than that of those which die from other operations. I do not believe in the indiscriminate removal of pulps from teeth that are to be crowned. Pulps should only be removed for some good reason, or when they are in a pathological condition. Supposing the pulp does die in a tooth crowned in this way, or supposing a fracture of the porcelain occurs in a jacket crown, then there is no great harm done, because the pulp can be removed, or a new crown made.

MEMBER. I would like Dr. Capon to explain a little more fully the use of the jacket crown as a bridge abutment. Does he simply fuse to the crown or to the metal frame?

Dr. B. S. HERT, Rochester. I have used the jacket crown to some extent and have found it to be a very successful method of restoring anterior teeth. I have placed such crowns over vital pulps, and never so far have had pulps die under them. I would like to hear more about the third type of which the essayist spoke. How frequently does he use it? and how advantageous is it as compared with the jacket crown?

Dr. H. E. S. CHAYES, New York. I would ask your indulgence for a few moments. I fully indorse the porcelain crown as one of the strongest crowns that can be made, but I want, with apologies to the chair and the essayist, to ask you to permit me to reply to some remarks Dr. Evans has made. I admire Dr. Evans and have great respect for him, and recognize the fact that as the author of a book on crown and bridge work, he wields a terrifying influence on the student mind. It is for this reason, and also in the hope that Dr. Evans will live long enough to recognize the error of his ways, that I am going to ask him to forgive me for taking issue with him. I agree with him that platinum should be placed beneath the gum margin. The fact that I went to the trouble to write an extensive article on the metallic crown, using the platinum collar and hood, and allowing it to extend beneath the gum margin, proves that I agree with him in that respect. Dr. Evans did not present the pulp proposition in a quite fair way. I am not as experienced as Dr. Evans, and believe there are few who are; yet I think you will grant me that in the past few years I have had enough experience to be entitled to speak as to whether or not the pulp should be extirpated when a crown is placed on a tooth. Cases have been referred to me from all over the land, and in hundreds I have seen pulps left under crowns because the dentists believed that this was permissible. They have not taken the trouble to test the pulp and have exposed the tooth to the contact of the metal and of phosphoric acid during crystallization, which sometimes requires periods of weeks. It is far better to extirpate that pulp when it is in a good condition before crowning than to wait until it has died and become infected, and has infected the periapical tissues further and thus set up trouble with which we are unable to cope. Such pulp trouble is not apparent in the mouth, but it affects the system, setting up, at some point beyond the tooth, an irritation which may require years to manifest itself.

This word of warning I want to give to the young practitioners present who have heard Dr. Evans, and, with that word of warning, I want again to assure Dr. Evans that I have the greatest respect for him, and that my remarks have not been made in any spirit of antagonism.

Dr. Evans. As Dr. Chayes remarked on my remarks, I think it entirely out of order to raise the discussion of a subject irrelevant to the paper. If you wish to give me the floor, I shall, however, be glad to answer Dr. Chayes.

Dr. R. Ottolengui, New York. I fail to see that it is out of order to discuss the question of leaving vital pulps in teeth to be crowned, when one of our prominent teachers has just read a paper on leaving such pulps intact. It certainly seems to me that the discussion of that matter would be interesting and pertinent to the subject under discussion. I want to say, if Dr. Evans can prove that teeth may safely be crowned with pulps in them, he will do more good for this audience than we can get by discussing any other subject; for there is no question before the profession today that is of more importance than just that—whether to remove pulps, whether not to remove them, and when to do either. I hope Dr. Evans will be given the floor to tell us all he knows, if he thinks he knows, as to when it is safe to leave pulps in teeth that are to be crowned.

Dr. Evans. Many years ago, as a student of Dr. Karl Heitzmann, who was one of the greatest dental histologists, I learned to respect the pulp. I believe the essayist is of my opinion, and the rational men in the profession probably also believe as we do. This is one of the most important subjects before the profession today. I agree with Dr. Ottolengui that this is a sensible question to discuss, but I think it is a little out of place at this time. The question resolves itself into just this: We all know and acknowledge that, when a tooth is considerably ground down, there is some irritation caused to the pulp; a certain amount of calcification goes on in the pulp, and, if we have the radiographs taken which have been talked about so much this evening, we shall see calcification going on—you may term it degeneration of the pulp. Suppose it does go on, suppose that one-third of the trunk portion of the pulp is calcified, what remains? Two-thirds of the vital portion maintaining vitality in the dentin and cementum, and as long as there is a healthy portion in the apical end of the root, its vitality will maintain health not only in crowned teeth, but in teeth affected with pyorrhea.

In regard to metal touching or resting against the dentin, there is little metal in direct contact with the tooth. There are no teeth that are crowned with metal, except in exceptional cases where there is a great deal of enamel and dentin left, hence most of the metal touches the tooth structure, and even in these cases there is an intervening film of oxyphosphate. In some of the work shown by Dr. Capon, where he removes the front portion of the teeth, there is no metal present, and the oxyphosphate is all that intervenes between the porcelain and the dentin.

I have been a practitioner for fifty years, and I put my experience and observation against that of a man of only fourteen years' practice. I have made a practical study of pulps in teeth for twenty-five years.

Dr. Ottolengui. It is an exceedingly unfortunate fact, when a matter of such importance comes up for discussion, that we cannot discuss it dispassionately and impersonally. I do not think it matters very much who makes a statement, if it be true, but I think it matters very much if a statement is made that is misleading. It does not necessarily follow that, because we have had long experience, and because we have not observed certain phenomena, that these phenomena do not occur. If you had asked me three years ago whether I could fill root-canals, I would have told you that I could. Why? I was using identically the same technique as I am using now, with all the care and skill that I am now employing, and have

been employing for some twenty-odd years, with the single exception that up to three years ago I was not doing what I am doing now—namely, checking up every filled canal with a radiograph. And now looking at this work with the aid of the X-ray, what do I discover? I discover not only many teeth filled long ago that are not so well filled as I had thought them to be, but teeth that I filled yesterday not filled so well as I had thought them to be. So you see it is not a question of how long, but how accurately we have observed a thing.

Now let me say a word about the question of pulps. There is only one absolutely safe pulp to leave in a tooth, and that is the pulp in a tooth that is absolutely normal. A tooth begins to undergo pathological disturbances just as soon as it suffers from traumatism. It is not the quality of the cement, but the depredation in grinding and preparing the tooth for a crown that starts up a retrogressive metamorphosis in that tooth. Dr. Evans told us what would happen if we did this; that we will have a tooth with one-third or two-thirds of the pulp calcified and the rest doing service. Sometimes, but not always by any means. I could recite the history of more than one patient who had suffered many years from neuralgia because of the calcification of such pulps, with no infection and with no outward sign of trouble. This question of "no trouble" is one of observation; that is, you *think* a tooth has given no trouble. As has been well said, and as you will hear it better said by Dr. Grieves tomorrow, the best time to fill a root-canal is after a healthy pulp has been removed. The trouble in leaving pulps in teeth with the idea that one can drill through the crown later is this: Serious infection may occur long before patients know anything about it, and sometimes they never know anything about it, and when they do make the discovery there may be an apical disturbance which perhaps none of us can cure, which we know cannot be cured by surgical operation—in other words, a permanent disturbance. I want to say in closing that we are not nearly so apt to see teeth that give trouble after our own operations as we are to see teeth that give trouble after our neighbors' operations.

Dr. Capon (closing the discussion). I wish to thank all of you for listening so patiently to the arguments started by my pictures, and the discussers for their kind remarks about me and about each other.

Pulp vitality is certainly a very vital question. Why am I showing these pictures? Why is it that I take pride in doing this particular kind of work? I have practiced just twenty-five years and have been doing this work continuously, and I think I have saved myself a lot of trouble in not worrying about the pulp. [Applause.]

Dr. Ottolengui. You let your patients worry?

Dr. Capon. My patients do not worry, and the only time that I worry is when a long interval elapses before I see my patient again. The one reason why I have such regard for the pulp when it is normal, is that I know nature has filled these canals better than I can do it. I showed you pictures of only a few cases of this work, and although I have treated hundreds of cases of various kinds, ranging from a single tooth to ten and twelve and fourteen in a mouth, the death of a pulp is rare. In seventy-five per cent. of these cases the crowns cover living pulps, and the percentage of trouble is so small that you may question my veracity if I give the correct figures. You may extirpate all the pulps you want to, but I am proud of the fact that I do not do this unless I have to, and I am going to continue this practice, because I have proofs of the value of the work in these cases and in many others which I have not shown you.

The grinding of the teeth is frequently the cause of much trouble after the tooth has been crowned. Too many teeth are ground with a dry wheel, setting up an irritation which will eventually result in the death of the pulp. Keep plenty of water on the wheel, and do not push the grinding too hard, and

if you cannot prepare the tooth properly in this way, you can devitalize—you can always do that. The margins where the crown presses the gums are healthy in the majority of cases, because platinum is the medium; there is no getting away from the fact that this metal is most acceptable and non-irritating to the tissues.

With regard to using the jacket crown for bridge abutments, I advocate this work where there is a probability of showing gold, and I showed you a few instances where it has helped me splendidly.

The lasting qualities of the jacket crown have been a surprise to me as well as to others, for they do not seem to have sufficient attachment for the resistance of such power as we exert in the use of our teeth. However, they *are* strong, and I use them in cases where nothing else could be substituted. I have in my own mouth a crown that is an example of the almost impossible. The root was nearly gone and had to be reinforced with a screw post and amalgam previous to being crowned with a jacket crown. Twenty-two years of continuous and not particularly careful use do not seem to have made much impression on that crown. If we have accidents occasionally, we can easily repair them. The jacket crown never splits roots; I have never had a root split under a jacket crown.

The number three crown asked about is one that I recommend under conditions that will be explained at my clinic tomorrow. The technique of making the other crowns will also be given in detail on that occasion.

The meeting then adjourned until the Friday afternoon session.

(To be continued.)

CONNECTICUT STATE DENTAL ASSOCIATION.

Fifty-first Annual Convention, held at Hartford, Conn., April 20 to 22, 1915.

TUESDAY—*Morning Session.*

THE fifty-first annual meeting of the Connecticut State Dental Association was called to order at 11 o'clock, Tuesday morning, April 20, 1915, by the president, Dr. Charles H. Riggs of Hartford, in Foot-guard Armory, Hartford, Conn.

Before the regular business of the session was taken up, Dr. B. A. Sears, on behalf of the members of the society, presented to the president, Dr. C. H. Riggs, a handsomely engraved gavel as a memento of the fifty-first annual meeting of the Connecticut Dental Association.

The first order of business was the reading of the minutes of the previous meeting.

Dr. PRENTIS moved that the reading of the minutes be dispensed with, as they had appeared in the published Transactions. (Motion carried.)

After the transaction of various items of routine business,

Dr. BROOKS moved that the Secretary be instructed to send to Dr. Beecher of Waterbury a bouquet of flowers, with expressions of regret at his inability to be present at the meeting on account of illness, and wishes for his speedy recovery. (Motion carried.)

Motion was made and carried to adjourn until the afternoon session.

TUESDAY—*Afternoon Session.*

The meeting was called to order at 2.30 o'clock by the president, Dr. Riggs.

The President appointed as the Committee on Nominations of Officers for the coming year, Dr. D. W. Johnston, Dr. James McManus, and Dr. F. T. Murlless, Jr.

Dr. Riggs announced as the next order of business the reading of a paper by Dr. C. H. Gerrish, Exeter, N. H., entitled, "Prevention—the Technique of the Future."

[This paper is printed in full at page 986 of the present issue of the Cosmos.]

Discussion.

Dr. E. S. Gaylord, New Haven. I have listened to Dr. Gerrish's interesting talk not only with interest, but with great profit, and I would say a few words in support of his statements.

We are all greatly interested in oral hygiene, and it is gratifying to learn of a man who has been in practice fifty years and has been practicing oral hygiene during that time. I think he stands unchallenged as the man who introduced this method of cleansing teeth, and first credit is due to him, instead of, as it has heretofore been given, to Dr. Smith of Philadelphia. My only criticism is that Dr. Gerrish has not given us his method of procedure long ago. The practice of cleaning teeth I can only indorse, knowing full well, after a period of perhaps fifteen years of faithful service along this line, that it will render teeth very largely immune from decay. We know very well that by properly cleansing the teeth of children through the developmental stage of the deciduous teeth, we can reduce a very large percentage of caries—Dr. Smith places this proportion as high as 70 per cent., but in any event we know that oral hygiene is productive of prolonged life in teeth and of the health of the mouth generally.

I would like to mention at this point an experience which illustrates very forcibly what persistent brushing of children's teeth in the full sense of the word will do. I could take you to an institution in New Haven where there are constantly from one hundred to one hundred and twenty-five children, inmates of an orphan asylum, and show you the beautiful results obtained from the proper brushing of the teeth. I have had the pleasure of visiting this institution with Dr. Wright of Harvard a few days ago, and after seeing these children, who presented themselves with open mouths and distended lips, as instructed by the matron—who, by the way, is a physician—Dr. Wright said that during a practice of twenty-five years he had never seen such conditions as in those children's mouths. This examination was made with an electric mouth-lamp and it showed oral conditions that were perfect so far as caries was concerned. This shows what is meant by thorough brushing of the teeth, which we do not find among our own patients. If we can induce these children to do their share, and the profession to do its share, we shall produce the condition that Dr. Gerrish speaks of, viz, a condition of immunity from decay for twenty-five or thirty years.

There is, however, a very serious problem that we must solve before we can reach that condition. Few of us are situated so that we can take up prophylactic work in our offices and conduct it properly. We are overwhelmed with operative work. Prophylactic treatment involves much time that we cannot afford to give it in most cases, from a financial point of view. We cannot afford to spend the time necessary for polishing teeth as it should be done, and yet Dr. Gerrish proves that such polishing is the most important part of dentistry that we can perform, and of greater value to the patient than the filling of cavities. We must, therefore, commence with the children.

The question as to how we shall regulate the practice of prophylaxis will be presented before one of the sessions of this meeting. The great problem before us cannot be solved by graduates from the colleges; they are not suited to do that work, and it seems that at the present time the most feasible plan is to educate young women to do this special work. I believe and hope that the result of Dr. Fones' work for the past two years will ultimately force the dental

schools to establish chairs which shall be recognized as a feature in the dental educational scheme, for the purpose of preparing young women for the practice of prophylaxis. I can see no other way by which we can meet the enormous influx of work that is pouring in upon us, particularly at a time when so much is being demanded of us from the medical profession. We stand today in a delicate position, it seems. The medical man is recognizing the value of clean mouths; how shall that recognition be satisfied by the dental profession? With the natural duties involved by operative work we cannot possibly meet this demand. Someone, then, must give us oral hygienists to place the physician in a position so as to best prepare his patient to receive medical treatment. I believe the time is coming when the physician will call the prophylactic dental operator to the bedside of the patient.

We all recognize the value of Dr. Gerrish's work, and we can only regret his having so long withheld his fund of information from the profession.

Dr. A. J. Flanagan, Springfield, Mass. I have met Dr. Gerrish quite a few times in New Hampshire, and I have been called upon to discuss papers with him, and in summing up the substance of his career I think I am perfectly proper in designating him the dental sage of New Hampshire.

Dr. Gerrish touched upon the question of gutta-percha. I have been using gutta-percha since it was brought to my attention by the late Dr. Flagg, and am still using it; and I would say to Dr. Gerrish that some of these patients in whose teeth he has used gutta-percha may perhaps leave him for some years and go to some of the younger practitioners who condemn the use of gutta-percha, but some of them will eventually come back to him to have some more gutta-percha put in their teeth. I maintain that the best dentist is he who saves the teeth the longest, and the best filling material is that which saves the teeth the longest. I also maintain that the tooth tissues are subject to the same laws of health and disease as the other portions of the human body. It is just as sensible to guarantee immunity in any other part of the body as in the teeth.

Dr. Gerrish spoke of non-cohesive gold, and I beg to differ slightly with him in that respect. I have come to the conclusion that it is not so much the inherent qualities of the non-cohesive gold that save teeth as it is the operator's dexterity. I have had in my practice for twenty-five years several eminent clergymen whose early education was in Canada and who were patients of two or three dentists practicing there—now so long ago that they have forgotten the names of the practitioners. They had a number of so-called soft foil fillings placed in the anterior teeth that are standing today and doing service forty years after their insertion. I think that, while the preparation of the cavity and the condition of the teeth are very important, Dr. Gerrish has not put sufficient emphasis on the operator's ability.

With regard to gold crowns and bridges, there is no question that in many patients they increase the efficiency of the masticatory apparatus, but the question of efficiency can be overworked. Many crowns and bridges are placed to increase the efficiency, not of the patient's masticatory apparatus, but the efficiency of the dentist's pocket-book.

The essayist has made mention of Dr. Bloodgood's remarks. There is no question that we dentists from the beginning of our college training lay too much emphasis on mechanics. The medical profession has brought this to our attention in a way that we cannot overlook. We will have to consider pathology and therapeutics first, and mechanics afterward.

The question of pyorrhea has also been mentioned. In my opinion that is only a phase of interstitial gingivitis. Though innumerable chemical agents and instruments have been foisted upon us in the last few years, yet there is no treatment for these conditions more effective than perfect surgical cleanliness and the use of the tooth-brush.

Dr. Gaylord has spoken of Dr. Fones' work and the attitude of the medical profession toward our work. Any reader of the journals must come to the conclu-

sion that the public is getting wise, and will demand of dentists what they have never demanded before, and it is up to us to do our share, else we shall be left in the race. There is plenty of enlightening literature presented in the public press as well as in dental journals—but we do not have reading dentists; they seem to be unwilling to educate the public and their own profession sufficiently in the best means of treatment. Here the question of economics enters. Dr. Gerrish, for instance, has arrived at the stage in his practice where his *clientèle* is limited to three patients a day. The average dentist, unfortunately, cannot afford to conduct his practice in that manner, but after treating eighteen or twenty patients a day, and receiving a certain amount of money in recompense, how much necessary work has he slighted?—how much necessary prophylaxis has he left undone?

There is no lack of dental service in many parts of the country, but I believe there is a lack of the right kind. In every community there is a certain class of people who are perfectly able to pay for services of every kind, but it is the middle and the poorer classes that offer a great problem. We are not facing the problem of prevention properly, because economic conditions play a very important part. If we have trouble in securing sufficient returns for our services, then it is up to us to present that question to the public from an economic point of view. Let us be fair to ourselves when dispensaries are opened for the purpose of free service to the public and we are asked to give our service; let us study more carefully the economic conditions; let us go before the public and let them know that it is the brains in the fingers that save teeth, that dental operations from the standpoint of health are worth as much as the operation which Dr. Murphy performed in Chicago recently and for which he received a fee of five thousand dollars.

Dr. James McManus, Hartford, Conn. While, as Dr. Gaylord says, the medical profession is recognizing some of dentistry's important features, yet many of these they have not recognized until they have been forced to do so. For years, physicians have not done their part toward the intelligent, educated community in regard to oral conditions. They have neglected to instruct the mothers that, unless children are taught to take care of their mouths, they will not grow up healthy and with well-formed jaws. When the dentist finally gets hold of the child, which is seldom before five or six years of age, then the parents and physicians realize that there is a great deal of work necessary which might have been prevented.

Speaking of a full practice, I recall a remark made in this connection by Dr. Atkinson, who in his very forceful way said, "A full practice is a —— bad practice." In such a practice it is nearly impossible for the average dentist to give the necessary time to his patients. Yet, few patients do not enable him to pay his running expenses, and therefore he has to have as many as he can get. There is another bad feature that has become evident in late years—that is, that every dentist is trying to command very high prices, especially the younger men. Wealthy people can pay them, but how can the poorer people pay the prices that are demanded? There is hardly a young man graduating from a college today who is not looking forward to the time when he will have a well-paying practice, and one of the brags that we hear frequently from a dentist is that he has received fifteen or twenty dollars for a crown. Poor people cannot pay such prices, and the reason why so many of these operations turn out badly is because the dentist is simply working to get the work finished and receive his money.

I have known Dr. Gerrish's work for years. The reason why the work which he speaks of has lasted thirty or forty years is because it was done by dexterous operators. Many of the modern appliances have been a detriment. The operator who is conscientious with himself and his patients is very apt to do good work, a great deal of which will last as long as Dr. Gerrish's work has done.

Dr. N. A. Stanley, New Bedford, Mass. The essayist has touched upon

so many dental subjects that I shall take time to discuss but a few of the points.

I have been working along the lines of prophylaxis for many years, but it was only about eight years ago that I went into it in anything like a scientific manner, and though some days the work seems monotonously weary, yet, if prevention is to be carried out in our practice, this work must be done. The medical profession is recognizing the importance of oral hygiene as an important factor in the health of the individual. There is, however, so much to be done in prophylaxis treatment that it is beyond a general practitioner's powers, and I have felt for a long time that we should have a law sufficiently broad to allow the trained hygienist to do this work, not only in institutions, but in private practice as well. These trained assistants could be to us what the trained nurse is to the practitioner of medicine and surgery, especially since this work can be done as well by the trained hygienist as by the dentist himself. When I first inaugurated this work in my practice, I used to see patients quite frequently—once a month—but as the conditions improved, and the gums became firmer, offering better resistance, I gradually extended the time between visits, until I reached a practical working basis. I have a large list of patients who come when sent for, and they are glad to be relieved of responsibility in this matter.

Dr. Flanagan very fitly remarked that the secret of filling teeth lies in cavity preparation. It is not so much the material used; all materials are good in their proper places. There is no work in which judgment is required more than in ours, and often judgment as to what not to do is more valuable than anything else. It is the preparation of the cavity and careful technique that bring results.

Washes, etc., for the cure of pyorrhea, are no doubt a factor in mouth hygiene, but cannot be viewed as specifics for so serious a disorder.

I would like, at this time, to pay a tribute to my friends Dr. Gaylord, Dr. Gerrish, and Dr. McManus, who have given their best thought and energy over a long period of years in working for that which is highest and best in our great profession. They are with us now, and the shining example of their careers illumines the way of those who are to follow.

Dr. Gerrish (closing the discussion). I wish to thank you kindly for giving so much time to the discussion of this subject, which has been my like-work.

Dr. Stanley spoke about good judgment; I would say that good judgment is to me the greatest asset that any man can have.

Dr. Flanagan spoke about the use of non-cohesive gold and the operator's ability. Of two students, the one may use cohesive gold and the other non-cohesive gold in filling teeth, and the non-cohesive gold will save teeth better. It is the material, not the man.

I wish to thank Dr. Gaylord, Dr. Flanagan, and Dr. McManus for their kind remarks, and close with a little poem I am very fond of quoting:

We come into the world naked and bare,
We go through the world with sorrow and care,
We go out of the world God only knows where,
But if we are thoroughbreds here, we'll be thoroughbreds there.

The next order of business was the reading of a paper by Dr. F. H. Nies, Brooklyn, N. Y., entitled "An Improved Method of Anchoring Detachable Crowns in Vulcanite Plates that is Fifty per cent. Stronger than Any Other Method in Use."

Dr. Nies' paper was discussed by Dr. O. T. Rule, Stamford; Dr. L. P. Abbe, Hartford; Dr. E. S. Gaylord, New Haven; Dr. L. J. Weinstein, New York, and closed by Dr. Nies.

Dr. Prentis moved that a vote of thanks be extended to Dr. Nies for his paper. (Motion carried.)

Motion was made and carried to adjourn.

Tuesday—*Evening Session.*

The meeting was called to order at 8 o'clock by the president. Dr. Riggs.

The first item on the program as announced by the President was the reading of a paper by Dr. O. W. Huff, Hot Springs, Ark., entitled, "Tone Diagnosis in Relation to Reflex Symptoms." Dr. Huff's paper was discussed by Dr. G. C. Fahy, New Haven; Dr. R. W. Strang, Bridgeport; Dr. M. J. Loeb, New Haven; Dr. B. A. Sears, Hartford; Dr. J. W. Harper, Hartford; Dr. C. H. Gerrish, Exeter, N. H., and closed by Dr. Huff.

Motion was then made and carried to adjourn until the Wednesday morning session.

Wednesday—*Morning Session.*

The meeting was called to order Wednesday morning at 11 o'clock, by the president, Dr. Riggs.

The first item on the program for the morning session was the reading of a paper by Dr. Ellison Hillyer, Brooklyn, N. Y., entitled "The Retention of Partial Dentures," which was illustrated by numerous lantern slides showing the various retention appliances.

[This paper is printed in full at page 1019 of the present issue of the Dental Cosmos.]

Discussion.

Dr. N. A. Stanley, New Bedford, Mass. While I had no intention to partake in the discussion of this paper, I have done more or less of this work in routine practice. The essayist has given us a most comprehensive paper, and has shown us some splendid devices to aid us in this work. It is our duty to save all the teeth we can, and to that end I am sure that more and more of these devices will be used.

With regard to bridge work, I have used more fixed than any other bridges, but I have been very careful in the selection of my cases. I have found the Gilmore attachment very useful. A very unusual case which occurred in my practice was that of a young girl of seven or eight years, who had an infection necessitating the surgical removal of the entire left half of the mandible and to the first bicuspid on the right side. I did not see the case until some time after the operation. There was evidently sufficient periosteum left to produce new growth of bone, which took place most satisfactorily considering the nature and extent of the operation. The artificial denture supplied was held in place very securely by means of the Roach attachment, the ball being soldered to a gold cap on the first molar, and a Gilmore attachment, a cap on the first bicuspid carrying the short wire necessary to hold the clasp. The models of this case, which I have with me, may be found of interest.

Dr. L. J. Weinstein, New York. I am glad that Dr. Hillyer and others are advocating more sanitary—which means removable—bridge work, and partial plate work in preference to bridge work—because that is one of the signs of the new era in dentistry. I regret that he did not describe in greater detail the construction of these various appliances. In my opinion simple forms of dentures are preferable to complicated appliances, because what we want is simplicity and efficiency. The first question involved in every case is what material we are to use, and we should select one that has proved itself efficient. I will not, however, go into the discussion of the various metals, as I have the honor of contributing a chapter on metals to Dr. Peeso's forthcoming book which will give me an opportunity to present my views in detail. If one is using a clasp, he should use good metal, as it is a poor principle to have clasps snapped off in a few weeks because an inefficient metal has been used. (Dr. Weinstein then showed a number of slides illustrating the changes which occur in plaster during the vulcanization of dentures. He also spoke of the various forms of attachments used in making partial dentures, and explained the advantages of the different forms over the ordinary clasp. He also mentioned the fact that the abutments should be relieved of pressure from the denture during mastication, and spoke particularly of the value of the Gilmore attachment in relieving this pressure.)

Dr. O. T. Rule, Stamford, Conn. I

hope it will not seem presumptuous on my part that while the slides were being presented I asked the operator to keep out one that illustrated a partial lower denture retained by clasps on the bicuspids; the teeth that were supplied were the molars. I wish to give certain reasons why I favor the Roach attachment for such cases. Clasps are not used to support the denture, but simply to retain it, the correct principle being that the soft tissues should do the supporting; and the partial lower denture referred to will illustrate the point.

If the clasps are used, and shrinkage of the gum takes place, the plate settles and a strain is brought to bear upon the clasped teeth. This is the very thing that we wish to avoid. With the Roach ball-and-socket attachment there is room for lateral and vertical motion of the ball in its socket, the adjustment is automatic, and whatever the direction of the applied force there is no tension upon the teeth which are used as retainers or abutments. In cases of shrinkage of the gum, the ball simply slides a little farther down in its clasp socket as the denture goes to place, and no strain is put on the teeth to which the socket is attached by a gold cap or inlay. In cases of shrinkage of the gums, I think the occlusal spur on a clasp is a positive detriment.

Dr. Weinstein says the way to compensate the pressure of mastication is to make the vulcanite saddles, cut out the under side, put in modeling composition, have the patient bite upon it, and then substitute vulcanite for the modeling composition;—that, in masticating on a denture thus made, the denture will spring to place as soon as the pressure is removed. When clasps are used in connection with that method the clasps will also spring up on the teeth, and this constant up-and-down action will surely wear the teeth. With the Roach attachment none of these occurrences would matter.

Dr. Hillyer (closing the discussion). Dr. Weinstein's suggestion that he wished I had given more detail of construction is answered in my paper. When one starts to write a paper he endeavors to treat the subject in as concise a manner as possible, yet properly presenting the subject. I could hardly have left out any of the phases without having been taken to task by someone, yet I have given enough in this paper to have required weeks and months of work had I gone into detail.

I think Dr. Weinstein's contentions are correct in some respects, especially in regard to saddles. It depends a great deal upon the amount of pressure required in a given case. Some mouths can stand no pressure, and almost any appliance causes trouble.

The feature of the Roach attachment which Dr. Rule referred to is correct, but in many cases I do not feel that it gives the security one desires.

In conclusion, I may say that my object in writing this paper was to present only *fundamental principles.* Every case is a law unto itself, and has to be considered from its own individual standpoint. I do not like to hear men say that they use one system for all cases, as that is not the proper method of practice; I think this is true of every branch of our work.

Motion was then made and carried to adjourn until four o'clock Wednesday afternoon.

Wednesday—*Afternoon Session.*

The meeting was called to order Wednesday afternoon at four o'clock, by the president, Dr. Riggs.

Dr. Riggs announced as the first item on the program for the afternoon session the reading of a paper by Max R. Smirnow, M.D., New Haven, Conn., entitled "Etiology of Pyorrhea Alveolaris."

[This paper is printed in full at page 1010 of the present issue of the Dental Cosmos.]

Discussion.

Dr. J. M. Gompertz, New Haven, Conn. I wish to congratulate Dr. Smirnow on his very excellent and instructive paper. I agree with him in his conclusions that the immediate cause of pyorrhea alveolaris is bacterial. In most of

my cases, where cultures have been made, I have found the streptococcus viridans to be the organism present, and in these cases an autogenous vaccine has been used with very gratifying results.

Although the experiments performed on cats by Dr. Smirnow are not complete, the results already reported by him tend to emphasize the fact that the cause of pyorrhea is bacterial. It is extremely interesting to note the essayist's comparison of pyorrhea with different infectious diseases. Undoubtedly his theory of host and invading organism is true, for many of us see these conditions suddenly become more acute, but when the general tone of the system is improved they subside, and relief or cure is obtained.

Dr. Noguchi, in a recent conversation which I had with him on the etiology of pyorrhea, said that he believed that the treponema mucosum, which he has cultivated from pyorrhea pockets, is the cause of the characteristic odor which is generally present. He does not, however, believe this spirochete to be the etiological factor.

We must not lose sight of the fact that any number of cases of so-called pyorrhea alveolaris are incorrectly diagnosed, as this condition is not by any means as frequent as we are led to believe. I have no doubt that emetin hydrochlorid has produced favorable results in the treatment of pyorrhea, but it is a question whether the results are as permanent as we are invited to believe, and we should therefore be on the lookout for recurrences of the disease in parts of the mouth remote from the original place of attack. In the treatment of pyorrhea many factors must be taken into consideration, as it is a well-known fact that there are many varieties of this disease, and an endeavor should first and always be made to attempt to discover the variety with which we are dealing, because a successful diagnosis in any disease is essential to successful treatment. The urine of the patient should be analyzed, and the prevailing organism in the pyorrhea pocket sought for. When this has been accomplished the general system should be looked after. Instrumentation, prophylaxis, and the use of autogenous vaccines seem to me rational means of treating pyorrhea.

Dr. M. L. Loeb, New Haven, Conn. It is with great pleasure that I make a few remarks on the paper presented by Dr. Smirnow, not as an authority on the treatment of pyorrhea alveolaris, but because of a combination of circumstances which some time ago led me to look into the treatment of pyorrhea with emetin hydrochlorid. When the first announcement appeared in reference to the presence of endamœba buccalis in the pockets around the roots of pyorrheal teeth, the opportunity presented itself to me to do some work at Yale University in investigating this subject, and I was fortunate in receiving instruction and assistance from one of the greatest protozoölogists we have in this country today, and also another who comes from Europe, Dr. Rhoda Erdmann. We examined a great many cases from those in my private practice (as I had not access to hospital cases), and in a great many we found the endamœba buccalis present, but in many we did not. We did not rely for the determination of their presence upon a hasty examination, but carried the observation to permanently prepared slides, nor did we determine positively that amœbæ were present unless we saw the division of the nucleus, which according to protozoölogists is the only definite way of telling that the organism is the endamœba. We have been led to believe that a great many organisms which have been called endamœba buccalis are not the endamœba, but organisms that look very similar. There are, in some cases, epithelial cells that appear very similar to this organism; the common yeast-cell looks similar and takes the same stains, and many who are not familiar with the endamœba buccalis may be led to believe that this is it. In my opinion the endamœba is not present in every case, and in those cases where it has been found, it has not been numerous. The thought has occurred to me that possibly the so-called endamœbæ buccales which have been recently described by Barrett and Smith and coincidently by Chiavaro, also by others as far back as 1879, may

be different and may not respond to the alkaloid of ipecac, emetin. Barrett and Smith were led to the use of emetin because of the similarity of the endamœba buccalis and the amœba coli and histolytica, which is found in the digestive tract. There is a marked similarity between these organisms, and it is quite likely that this fact led Dr. Barrett and Dr. Smith to use the same treatment. It may be that another alkaloid of ipecac may be more effective, one that we have not found as yet. I agree with the essayist that the continual presence of streptococcus bacillus would tend to make him believe that organism to be the primary cause, rather than the endamœba. Then we might consider the question of whether or not there may be two forms of pyorrhea, one in which the streptococcus bacillus, and another in which the endamœba is the primary cause. I would emphasize Dr. Smirnow's thought that emetin is not a germicide; that is very clearly marked in studying slides where the endamœbæ have disappeared very rapidly under the treatment, and others where accompanying organisms have remained.

The question then arises as to the treatment and cure of pyorrhea by inoculation. The essayist doubts whether many cases have been permanently cured with emetin. The fact that pyorrhea does subside after a few treatments with emetin hydrochlorid leads me to believe that we are on the right track. It may be that we have not yet discovered the proper amœbicide, but I think in the near future a system will be evolved whereby the treatment may be made more lasting. It has also occurred to me that, when the bacteria are destroyed by vaccines and there is no recurrence of pus, it is possible that because the bacteria have been destroyed by vaccines, and the white blood corpuscles which are the food of the amœba are revived, the amœbæ lose their nourishment and find themselves exhausted. Of course, we must take into consideration at the same time the fact that, while we are destroying bacteria, we are building up the tissues, making them more resistant and making it less possible for the amœba to live. It would be interesting and would probably add a great deal of weight to the value of Dr. Smirnow's experiments if the cats were examined for amœbæ before injection or vaccine treatment. I think that is a most important point. If there are no amœbæ present when the streptococcus viridans or a similar bacterial serum is injected, or when the cat is inoculated, and after some time we find the amœba present, it would be reasonable to suppose that the amœba buccalis was the secondary infection, and the organisms that were inoculated were the primary ones.

Dr. G. C. Fahy, New Haven, Conn. The case of arthritis deformans of which Dr. Smirnow has just spoken came under my care at the hospital in New Haven. The patient, a woman of forty-two years, had been confined to the institution for a period of six months. She was unable to walk, as there was no mobility in either of the hip-joints. She was given the usual internal treatment for arthritis, and in addition she was anesthetized and both legs were flexed with the hope of breaking up the adhesions in the hip-joints. This treatment was a failure. The patient returned to her home, and in three months came back to the hospital. It was at this time that she came under my care. She had a marked case of pyorrhea alveolaris. A culture was taken, from which Dr. Smirnow made a highly sensitized vaccine. The mouth was thoroughly curretted and cleansed, and a mouth-wash of formaldehyd used. The vaccine was given every four days, and after the third injection the patient began to improve rapidly, the mouth cleared up, and there was more freedom in the hip-joints. At the end of the fifth week she was etherized and the legs were flexed and the adhesions broken up. The patient now has a mobility of 60 per cent. and walks without any difficulty. There has been no recurrence of the arthritis deformans or pyorrhea alveolaris during the eighteen months since the patient was discharged from the hospital. The result in this case, as in the previous

case cited by Dr. Smirnow, shows quite conclusively the great value of the autogenous vaccine.

Dr. Theodore Blum, New York. I have had no experience with the treatment of pyorrhea, but from what I have heard and experienced at different hospitals I am inclined to say that up to the present time we have come to no definite conclusion in regard to the etiology of pyorrhea, but that we may probably come to some conclusion very soon, as I can state today that one no less capable than Dr. Flexner will start within the next two weeks the examination of cases for both bacteria and endamœbæ to follow up vaccine treatment. After having listened to the discussion of this afternoon, I feel once more proud to belong to this our beloved profession—after the mystic and medieval theories of zone therapy brought before you last year, and of tone diagnosis, which you listened to the other night.

Dr. N. A. Stanley, New Bedford, Mass. This is a subject in which I am deeply interested. I wish to go back a few years and touch upon the work of one of our eminent scientific investigators in this line, Dr. Thomas B. Hartzell. Dr. Hartzell was a bacteriologist and pathologist before engaging in the study of dentistry. Naturally from the medical standpoint, he tried to treat pyorrhea by means of vaccines, and subsequently gave this method up for instrumentation, surgery of the root, by which means results were obtained which can be reached by no other medium. The medical practitioner who attempts to teach dentists how to treat pyorrhea does not lay sufficient stress on the importance of surgery—which has to be done first, or results will never be obtained. The physician's idea is to give a pill that will correct the ill. In cases where vaccines are used, permanent results will not be obtained as when good surgery is used—that is, really good surgery, not indifferent work. The scaling of roots is a difficult operation in many cases, and requires the delicate sensitive touch of fingers trained to do this work. In eight years or more I have seen but one case in which I wanted to try a vaccine, and that was a case of tubercular nature.

With regard to the etiology of pyorrhea, I remember hearing Dr. Patterson speak on this subject a number of years ago, and he said that anything from a piece of string to whiskey will cause pyorrhea. In a large percentage of cases, I believe that some initial lesion is the beginning of the pus pocket. When there is an irritant that will produce inflammation, germs, which are always present, will carry on the work, and when inflammation has developed sufficiently it will go on independently of the original cause. It takes very little to produce a pus pocket sometimes. I recall a case where a tiny piece of rubber dam had been left under the margin of the gum on a central incisor. In packing gold into a cavity the dentist had caught the dam between the gold and the margin of the cavity, and a year and a half later a pus pocket with considerable loss of the membrane had resulted. The peridental membrane is a tissue that when once destroyed does not reproduce itself. These little transverse fibers when destroyed leave very small pits or a roughened surface on the cementum that should be planed very smooth, for it is an ideal plaque-bearing area. Lost tissue cannot be restored, but in nearly all but extreme cases the continual destruction of tissue can be arrested, and if the parts are kept free from inflammation there follows a constriction of the gingivæ, offering stability and resistance.

Dr. Gompertz. I would like to inquire if the case cited was one of typical pyorrhea?

Dr. Stanley. It was pyorrhea, pus flowing from the alveolus. Débris forced between the teeth, or anything of an irritating nature will cause inflammation, destruction of the tissue and flow of pus. There was a pus pocket—you might call it something else.

Dr. Gompertz. I should not call that a case of pyorrhea.

Dr. Stanley. The term pyorrhea may seem too general. It does not adequately designate, in fitting terms, the different conditions that so often obtain.

Dr. Gompertz. I believe that a large percentage of cases which are called pyorrhea are not pyorrhea at all. We see many cases where cures are reported by vaccines and drugs in which an incorrect diagnosis was made, and the patients did not suffer from pyorrhea. In the case in question, it seems to me, the condition was due to irritation, not to true pyorrhea.

Dr. Stanley. I think the men who first used vaccines do not use them to any great extent at present. There will always be those who are looking for an easier method of doing things, but, if we take care of our patients as well as can be done today, it is up to us to become more proficient in this line of work. Persistent effort brings more uniform and gratifying results.

The medical profession is awakening to the fact that dental work is really of some value. There is no branch of medicine that offers a greater field for prevention than dentistry. Physicians have been treating symptoms, when the real trouble was mouth infection, and this is our exclusive field.

Dr. W. R. Harper, Hartford. Following out the thought of the last speaker, I want to ask three questions: Did Dr. Riggs, after whom the disease was named, get results? Second, did he know anything about emetin or autogenous vaccines? Third, did Dr. Riggs know pyorrhea, and did he cure it, or was it something that masqueraded as pyorrhea, as intimated by one of the speakers?

Dr. Stanley. In reply to Dr. Harper, I might say that the profession here in Hartford should know what Dr. Riggs stood for and accomplished along this line better than any of the rest of us. I think he must have obtained good results, probably not in all cases, but he first pointed out the essential factor toword the correction of this hitherto incurable infection. I happened to meet Dr. Riggs in the fall of 1884, and asked him what he used besides instrumentation. He said that very little else was necessary, and this statement I have verified over and over again. The amazing feature is that, after having once been started in the right direction, we have been so long in bettering the technique. Instruments are now being made much more delicately and scientifically than were those which Dr. Riggs made and used. Every conceivable form of excavators, chisels, and pluggers has been devised and is in use for the preparation and filling of cavities, but when it comes to the treatment of the infection that causes the loss of more teeth than any other disease, when it comes to the planing of the roots, many operators seem nonplused at the number of instruments that can be advantageously used, and often exhibit an attitude of ridicule.

The root is the most important part of the tooth. We can get along without the pulp after the tooth is developed—we can crown the root, but what use is the tooth when the peridental membrane is lost, the membrane which serves to attach the teeth to the other structures? When that is gone, the function of the tooth is gone. We must have in mind that prevention is the keynote of modern dentistry, and if a practitioner is interested in prophylactic work he will be very apt to discover pyorrhea, or its incipient stage. If an instrument goes beyond a certain point at the free margin of the gum, destruction of the tissue is taking place, and that calls for immediate treatment just as a cavity demands immediate filling.

Dr. C. F. Bliven, Worcester, Mass. I would like to ask if instrumentation will tighten malposed and loose teeth.

Dr. Stanley. If the tooth is past the operable stage and not extracted, the only measure left is splinting. Malposed teeth are more prone to pyorrhea than others. Often teeth are inclined to one side; if the lingual portion is affected the tooth will draw toward the labial, because after losing its attachment the tooth is drawn to the opposite or healthier side.

Dr. Bliven. Sometimes we find the lower teeth firm, but the upper loosened owing to malposition and forced outward. In such a case can we rely on splinting to support these teeth?

Dr. Stanley. I could not give a definite answer to such a question without

seeing the case, but if the teeth were very loose I should probably use a splint.

Dr. Bliven. I have a case similar to the one described, in which I have been using the violet ray. These teeth are now about two-thirds tighter than they were when I began the treatment; what the ultimate result will be, I do not know. I have followed this treatment daily for about a week with very good results. The cause of pyorrhea has never been settled, one authority saying it is systemic, another that it is local. What can the layman believe, under such conditions?

A Voice. It is both.

Dr. Bliven. That is a very good answer to the question. Diagnosis is, of course, of the greatest value to us in knowing what procedure to follow in our treatment. I have so far had such unusual results from the use of the violet ray that I would wish to have my experience confirmed by my fellow practitioners.

Dr. Gompertz. I do not question Dr. Stanley's ability to do correct surgery, but I have observed many cases where instrumentation was done by competent men, yet no cures were obtained. In my opinion it is utterly impossible for any man to reach all surfaces of a multi-rooted tooth and remove all deposits. Along with other practitioners, I have experienced repeated failures, and am therefore skeptical as to the possibility of a cure by instrumentation alone. The following case may be of interest in this connection: A patient had been confined to the New Haven Hospital for about a month with a severe rheumatoid arthritis. Vaccine treatment was suggested, as instrumentation had been done by two dentists—as good instrumentation as could be done under the circumstances. The vaccine treatment was given, and there was an improvement in the patient's condition; the arthritis, however, continued. Two or three teeth were then removed, and an artificial plate inserted. An examination of the extracted molar teeth showed deposits of tartar which it would have been a physical impossibility for any man to have removed while the teeth were in the mouth.

Dr. Stanley. I agree with Dr. Gompertz that we cannot perform physical impossibilities in planing roots, but we have to do the best we can. The resistance of the individual has a great deal to do with the results obtained. The same treatment in one case might not be as effective in another. I have always considered this disorder as a local instead of a systemic affection, and I lay great stress on the after-treatment, especially in those stubborn cases that do not at first readily respond to treatment. Frequent prophylaxis treatments, followed with regularity, will do much to bring about the desired result.

Dr. Smirnow (closing the discussion). I am not a member of the dental profession and do not know much about instrumentation, but I have tried to follow closely, in a scientific way, some of the measures adopted by dentists, especially in pyorrhea. In answer to Dr. Stanley, there is no doubt at all that if good surgery is not instituted, no good results can be obtained in pyorrhea, in spite of either emetin or vaccine treatment. I called attention in my paper to the fact that we must continue the local treatment as much as possible, if we are to obtain good results with vaccine therapy. So far as the details of the surgical treatment are concerned, I do not consider myself qualified to make any statement. Dr. Stanley has spoken of the use of vaccine in only one case, and that a case of tubercular gingivitis. I would say that this was one of the worst cases that we could try vaccine treatment on, and I would consider this condition as contra-indicating the treatment. In such a case, the pyorrhea is probably secondary to tuberculosis elsewhere, most likely located in the gastro-intestinal tract, and the patient would not do very well under any form of treatment. Dr. Stanley claims that pyorrhea is the result of an irritant, and I agree with him fully, but we know that the formation of pus never comes from a simple injury. Pus practically always indicates an infection, which in the case of pyorrhea may be secondary to the injury. Dr. Stanley spoke of Dr. Waldeck's doing some work in regard to

systemic conditions in relation to the teeth. I referred to that, and to the work of Dr. Rosenow, who has found arthritis, also acute and subacute endocarditis, etc., as secondary conditions in infections of the teeth; but that does not mean that we can get rid of all of these conditions by the use of vaccines.

Dr. Stanley confused terms somewhat in referring to the regeneration of the peridental membrane. The peridental membrane does regenerate itself, but the pericementum, which is a specialized tissue, does not. As to "cleaning-up" the roots, care must be exercised not to clean too much, as one is apt to destroy something he does not wish to destroy, which will prevent the tightening of the teeth. I refer in particular to the pericementum, which, if destroyed, cannot regenerate itself.

Dr. Stanley spoke of a case in which stock vaccine was used. I do not believe in stock vaccines except for infection caused by staphylococcus; in most other conditions at all amenable to vaccine therapy we can get good results only from the use of autogenous vaccines.

As to whether we get results from emetin or vaccine, investigation will show that the use of these methods is simply one of the signs of progress, and is therefore justifiable. We accept theories today that were rejected last year, but only after they have been proved to be of absolutely reliable scientific value. Because such theories spring up it does not mean that we must flock to them, but on the contrary we must weigh them most carefully, and give credit where credit is due. Both emetin and vaccine are tentative methods of treatment, and there is an open field for investigation and discussion in both.

With regard to Dr. Loeb's remarks about there being more than one factor, of course that is possible, and I have pointed this out in my paper. My idea, as already indicated, is that we have a vicious circle in pyorrhea, beginning with an injury, due possibly to the accumulation of food, possibly to malocclusion or malformation with consequent excessive pressure on the teeth; possibly to faulty crown or bridge work, or to some faulty dental manipulation about the teeth that gave rise to the disorder. Bacterial invasion is most likely secondary to the injury, accompanied by the formation of toxins and the degeneration of the peridental membrane and the pericementum, with the accumulation of tartar. This in turn acts as a constant irritant and increases the amount of injury. Dr. Howe claims that this disorder is of exclusively systemic origin; that we have tartar formation as the result of degeneration of the membrane, and subsequently an infection is set up producing further degeneration; we have the vicious circle established, and that goes on until the teeth are lost.

Dr. Theodor Blum, New York. I would like to ask the essayist to repeat his statement about the peridental membrane and the pericemental tissue.

Dr. Smirnow. The peridental membrane is a thin layer of interlacing fibers extending from the pericemental covering of the tooth to the periosteal tissue of the alveolus.

Dr. Blum. As far as I remember the nomenclature in dental histology, the peridental membrane and the pericemental membrane are exactly the same. I think the essayist applied the term peridental membrane to the circular ligament which is part of the peridental membrane and is situated at the neck of the tooth and runs in a circular fashion from the neck of the tooth to the alveolar process. This is only a circular arrangement of the fibers of the peridental membrane, the other fibers running in a different direction, and the whole membrane, as I remember it, is called the peridental or pericemental membrane.

Dr. Smirnow. They may possibly be regarded as the same, but my impression is that they are different, the one being specialized and resembling osteoid tissue (pericementum), and the other being made up of numerous fine connecting fibers (peridental membrane).

(To be continued.)

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PHILADELPHIA, SEPTEMBER 1915.

EDITORIAL DEPARTMENT.

THE GEORGE EASTMAN BENEFACTION.

AT a meeting of the Rochester Dental Society, held July 20th, announcement was made by Dr. William W. Smith of the gift of a dental dispensary to the city of Rochester by Mr. George Eastman, founder of the Eastman Kodak Company—the dispensary with its endowment to represent an investment of about $1,200,000. The announcement of this splendid benefaction comes in a very definite sense as the fitting culmination of the devoted interest and sustained enthusiasm of the dental profession of Rochester as the pioneers in this country of the public school oral hygiene movement, and is an encouraging example of what may be accomplished for the promotion and establishment of public dental service in general wherever the effort is made to propagate in a practical way a popular belief in the beneficent character of such service and where its importance as a prophylactic measure against ill health is effectively demonstrated.

Twenty-eight years ago the Rochester Dental Society, recognizing the necessity for public dental service whereby the public school children and the poor of the city might secure the inestimable benefits of such service, established a dental dispensary at the Rochester City Hospital, where the teeth of the worthy poor could receive intelligent care free of charge; and the work was continued for two years, at the end of which time it was abandoned for lack of financial support. A few members of the Rochester Society, undiscouraged by the result of the first effort, refused to abandon the enterprise. They formed a committee, which finally reported that they had enlisted the interest of Captain Lomb, of the Bausch & Lomb Optical Company, who had agreed to pay the salaries of one or more dentists who would give half their time daily to the work. Mr. William Bausch made possible the installation of a complete dental working equipment in one of the principal public schools, and other public-spirited citizens have made like offers—which latter, in view of the Eastman benefaction, have been held in abeyance for the time being. It is understood that the valuable pioneer work of the Rochester Dental Society in practically demonstrating the value of oral hygiene work to the citizens of Rochester, and their activity in maintaining their educational propaganda with respect to public dental service, was the primary cause which enlisted the interest of Mr. Eastman in the movement itself—an interest which was further intensified by the establishment of the Forsyth Dental Infirmary in Boston under the benefaction of the brothers Forsyth. Mr. Eastman visited and carefully studied the Forsyth Infirmary in all its details, including the plan and scope of its activities and its financial foundation and organization, with the result that his study of the whole situation is now practically crystallized in this magnificent gift to his home city.

The plan of the gift is peculiar in certain respects, and manifests a thoughtful consideration for the future welfare of the institution. The Dispensary is to be built and equipped by the donor at a cost of about $300,000, on condition—First, that the city of Rochester provide at least $12,000 per year for five years to carry on the oral hygiene work in the public schools. Second, that private citizens contribute $10,000 per year for five years, Mr. Eastman himself to contribute $30,000 per year for five years, at

the end of which time the donor to furnish an endowment of $750,000 if the conditions have been met and the work is going on satisfactorily. The conditions imposed are already practically met, with the result that the enterprise is not only financially secure for the future, but what is of greater importance, the community of interest which is so practically achieved by uniting the city, the Rochester Dental Society, and public-spirited citizens with the founder of the Dispensary upon a basis of mutual interest in this great co-operative enterprise is not only an admirable working plan so far as effectiveness is concerned, but one which practically secures for all time its continued activity.

There is, moreover, in such an undertaking a moral factor which has evidently received thoughtful consideration in connection with the present benefaction. We have consistently adhered to the view that the normal relation of the oral hygiene movement is in connection with the public health service. The state has undertaken to care for the health of its citizens, which it must necessarily do, within certain limits, as a defensive or self-protective measure. Until comparatively recent times its activities were directed almost exclusively to the removal or combating of existing disease conditions, but with the recognition of the importance of preventive medicine the scope of public health measures has been enlarged to include many activities which are directed solely toward the prevention of disease. Heretofore the public health service has, broadly speaking, ignored the tremendous significance of the now well-established fact that most of the pathogenic organisms that are specific exciters of disease action in the human body find their way into the body via the oral cavity. Before the general recognition of this fact it became necessary to institute a campaign of education—those to whom the facts were known must needs make them known to all; and part of the campaign of education was the establishment of the means for public dental service by private enterprise. That has in various ways and in many places been done, and the Eastman foundation with its modified plan of financial organization marks the beginning of a new and encouraging epoch, wherein the municipality as a unit of the state is made a party to the activities of public dental service. It is a necessary factor in social evolution that individual initiative must precede state action and control in

public service, but in such generally important and vital interests as, for example, the public health, it is obvious that ultimately the state *quia* state must assume control and direction; for, as the state survives while the individual quickly passes, no other plan can insure the continuance of an activity so essential to the public welfare.

For which reasons we especially congratulate the dental profession and the city of Rochester upon not only their good fortune in securing this magnificent benefaction, but especially upon the wisdom and farsightedness which is manifested in the terms upon which the foundation is established. The examples of broad-minded philanthropy furnished by the Forsyth and the Eastman benefactions are practical evidences of the general recognition of the value of dental service to the public health which cannot fail to promote the creation of similar centers of usefulness wherever the demand for them is made evident by such pioneer educational work as was done in the case under consideration by the Rochester Dental Society.

REVIEW OF CURRENT DENTAL LITERATURE.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Deutsche Monatsschrift für Zahnheilkunde*, Berlin, June 1915.]

THE PIVOT TOOTH, WITH CONSIDERATION OF THE PHYSIOLOGY OF THE NORMAL AND PATHOLOGICAL DENTURE. By Dr. C. Julitz, Leipzig.

In his introductory remarks the writer emphasizes that the force of mastication is receiving more and more consideration in all the branches of dentistry. The denture is always to be regarded as a whole organism, not as a collection of individual teeth. A great many investigations have been made in regard to the force of mastication, the figures obtained varying from 22 to 650 kilograms. The masticatory force of human dentures is therefore different individually, as is also that of the individual teeth. According to Rumpel, the molars and premolars above all serve to bear the masticatory pressure, while the incisors and canines receive hardly any. Hence, if one of the ten molars and premolars in either jaw is lost, the remaining teeth are subjected to one-tenth more masticatory stress, and this additional stress continues to increase whenever a further posterior tooth is lost.

A consideration of these factors is regarded as imperative by the writer in the replacing of several teeth combined or of single teeth by pivot crowns. Certain physiologic peculiarities of every denture which are closely connected with masticatory force must be taken into consideration, such as peculiarities in bite, occlusion, and mastication. Since it cannot evidently be immaterial whether a pivot tooth is to bear a

masticatory stress of 30 or one of 135 kilograms, no one system of making pivot teeth will serve all cases, and individual variations must be employed according to the requirements of the case under treatment. Julitz is of the opinion that pivot teeth are suitable only for roots of incisors, canines, and bicuspids.

Before proceeding to make a pivot tooth, the following factors are to be considered: The number of teeth remaining; the presence of prosthetic appliances; the normal or abnormal occlusion in its many variations. The angles at which the upper and lower front teeth meet must be studied, and the points of contact of the lower front teeth with the upper noted. In a series of very instructive illustrations, four variations in angle and five modes of contact are demonstrated. The final criterion for the selection of one or another form of pivot crown is furnished by the condition of the root. The writer advances three cardinal principles which a pivot tooth must fulfil in every case, namely: First, a pivot tooth must offer sufficient resistance to the force of incision and mastication so that it cannot be deviated from its direction or cause fracture of the root; second, the porcelain facing must not be soldered to the metal body, so that it can be replaced without removing the metal body and pivot; third, it must satisfy the demands of esthetics as far as is compatible with the first two requirements. Failures in pivot teeth are due to disregard of the physiology of the human denture, and consist chiefly in loosening of the pivot teeth, labial or lingual deviation or torsion, fracture of the root, and the resulting complications. The various methods of making pivot teeth which comply with the requirements demanded by the writer are discussed, viz, the Richmond, Büttner, half-band, Sachs and Klughardt's crowns—the last two having a metal reinforcement in the upper portion of the reamed root-canal. All these crowns should always be made with interchangeable facings either cemented or riveted to the metal body. For certain cases, Davis and Justi crowns are suitable. For bicuspid roots the Richmond crown alone is considered indicated, either with or without pivot, also for the weak roots of the upper and lower laterals. For the central incisors and canines the selection of the most suitable form of pivot crown must be determined upon from case to case by the operator, with due consideration of the principles advanced by the writer. The shape of the pivot itself is important only in bandless crowns, the writer preferring a flattened tapering pivot of a length slightly greater than the crown.

[*British Dental Journal*, London, July 15, 1915.]

PSYCHIC DISTURBANCES IN NITROUS OXID ANALGESIA. By F. Talbot, L.R.C.P., M.R.C.S., L.D.S.,Eng.

Following the suggestion that, before undertaking analgesic work, the dentist should conduct a series of experiments upon himself—as only in this way could the most valuable information be gained as to the precise effect of the nitrous oxid and percentage mixtures of nitrous oxid, air, and oxygen upon the patient—the writer has made most interesting experiments upon himself. He warns those who wish to emulate these experiments of the quite serious dangers involved, and emphasizes how foolish and risky it is to inhale the gas while alone, demanding the presence of a second person who is familiar with the phenomena of anesthesia. The danger lies in the post-analgesic condition, in which the subject may believe himself to be perfectly normal and rational—in fact, he may seem so to others—but is very liable to be misled by errors of judgment which are not perceived. Thus, believing himself to have completely recovered from the effects of the gas, he may proceed to a second experiment; but this time he might easily fix the nose-piece firmly in position having in mind only the exclusion of air-leakage, with possibly fatal results. Less serious consequences might occur as the result of errors of apperception in dealing with the cylinders, glass vessels, instruments, or coal-gas jets, or in going down stairs. It should be noted that some people experience, for an hour after a comparatively lengthy gas administration, curious alternations of consciousness with imperfect recollection of the intermediate phases.

After these preliminary warnings, the writer proceeds to describe certain psychic disturbances which he has experienced in connection with the inhalation of nitrous oxid. The true analgesic state is in itself a strange and most interesting condition. With-

out special warning one passes into a sphere of complete physical well-being, accompanied by a sense of the insignificance and distance of all sources of worry or anxiety. The war does not matter now; other specific anxieties and responsibilities are remembered only to be thought of as not belonging to the observer, nor in the least affecting him. A splash of sunlight on a wall or some mark in the window-pane tends to attract the attention pleasantly, and even to absorb it. The world smiles, and its sunshine is answered by silent, beaming, contemplative joy. In saying, "I quite dread being recalled from this state, I enjoy it so much," the patient's voice has a curious far-away quality, but is sufficiently distinct. Recovery is gradual, and not at all unpleasant; with some hesitancy it is possible to recall, as from another plane of consciousness—as with dreams—the method pursued, the proportion of gases used, and what has been said.

When the nitrous oxid has been taken in a more concentrated dose a very different complexus of experiences may have to be recorded. In the category of bodily sensations, the writer has experienced frequently something like "pins and needles," or the pressure of a lump of ice, in the right hypochondriac region, a sensation which persisted in some cases for hours afterward in a moderate degree, and could be recalled very easily on subsequent days. Another sensation which made a marked impression upon him more than once, was that of having the tissue of the brain lacerated, so that it felt raw and the seat of a deep pain, in which all painful sensations which might conceivably be received would be annihilated. Awakening from this stage, he repeated, in order to fix the memory of the experience, the words, "The littleness of pain," by which it was implied that it seemed impossible to hurt him beyond that inner painful consciousness.

On another occasion the writer passed into the consciousness of having solved by experience the riddle of the universe, and to the sense that to have such an experience as that outweighed the value of all mundane life. To lose cognizance of immediate surroundings, but to be clearly related in thought to the sum of things, and to grasp the secret of existence, was realized as a prize for which life might well be sacrificed; and "How could it ever be known?" save at the price of passing over the borderline which is the limit of recovery. Here the writer awoke, repeating the phrase quoted. On attempting subsequently to analyze what had actually been his impression of the "secret of existence," he found he could only formulate the idea that love or pity could be described as the *motif* of the universe only if our conceptions were made wide and impersonal enough to include the very qualities of affectional indifference and pitilessness, as seen from the human point of view.

On another occasion, while conscious of having gained the secret of existence, the writer realized that he was no longer sufficiently himself to cut off the supply of gas. With the discovery of this "trick" by means of which the secret was automatically guarded from being known by living man, there came the suggestion that perhaps in this way the survival of the fittest might be promoted—as those who were foolish enough to tempt their fate in this way without proper precaution would be effectively weeded out; but he would not admit that the danger, being of a distinctly subtle nature, ought to have been anticipated by any reasonable person; and, at best, it seemed harsh, and even stupid, to apply a lethal chamber to those who succumbed to the lure of so noble a temptation as the fearless pursuit of the knowledge of the ultimate things. Something of Omar Khayyam's indignation possessed the experimenter, and he angrily turned the gas key. This occurred on two occasions; once the result was to cut off the supply of the gas, the other time to turn on oxygen at a furious rate, the sound of which fully awakened him.

The writer also describes the sorrow and grief experienced during his anesthetic self-observations over the practical unanswerability of all questions about ultimate realities, and his thought that the question and the answer involved a paradox or trick of thought, which served as a practical obstacle to any intellectual solution.

As for the question how far the views expressed correspond with the writer's normal attitude to religious or philosophical speculation, he avers that, speaking generally, there is nothing which strikes him as novel with the exception of the last suggestion mentioned, and that on the whole the correspondence of his thoughts in the natural and

anesthetic states is a close one. As a side observation, the writer was surprised more than once to note that a remark made directly to him by his companion recalled him powerfully to a state of full consciousness of his surroundings, or at least showed him that he was far more himself than he had supposed.

As a contribution to the psychology or psychopathy of inhalation anesthesia, this essay is of more than usual interest, and it is to be hoped that it will provoke the publication of similar observations by other anesthetists.

[*Bulletin of Johns Hopkins Hospital*, Baltimore, January 1915.]

INJECTION OF ALCOHOL INTO THE GASSERIAN GANGLION FOR RELIEF OF TRIGEMINAL NEURALGIA. By Dr. C. M. Byrnes, Baltimore.

Byrnes' clinical (fourteen cases) and experimental (in dogs) observations have convinced him that in the treatment of trigeminal neuralgia a single successful injection of alcohol into the Gasserian ganglion is followed by immediate relief of pain and all the symptoms indicative of its complete physiologic destruction. Although no general anesthetic is administered, the painfulness of the injection is not unbearable or greater than that experienced in making deep intraneural injections. In skilled hands this form of treatment is without serious risk, and no fatalities have been recorded as a direct result of the injection. Byrnes asserts that in spite of the contentions of Alexander and Unger, injections in man by exposure of the ganglion appear to be unwarranted and lacking in judgment, except in rare cases in which this slight saving of time may determine the immediate result during exposure of the ganglion. If the ganglion is in view or accessible, direct injection might be practiced; otherwise the original operation for removal or avulsion of the root should be employed. If deep neural injections have been unsuccessful, and repeated attempts to inject the ganglion by the subcutaneous method have failed, Byrnes agrees that an effort might be made to inject through the exposed foramen ovale before resorting to the subtemporal operation for removal.

It has been demonstrated, by fractional injection, that the extent of destruction may be, in a measure, limited to that portion of the ganglion from which the affected nerve-trunk originates; and that not infrequently the corneal fibers can be spared. From the distribution of corneal anesthesia, following partial injections of the Gasserian ganglion, it appears that the upper and lower halves of the cornea receive separate innervation. In cases of bilateral trigeminal neuralgia, injection of the ganglion possesses distinct advantages over other methods of radical treatment. Since anatomic continuity is not actually destroyed, and the motor nucleus is not directly affected, conditions are most favorable for recovery of motor function; while sensation should be permanently lost if the ganglion were completely destroyed. Thus, by allowing sufficient time for regeneration in the motor root, bilateral ganglionolysis might be safely practiced. Experimental studies appear to indicate that it is not probable that the ganglion can be completely destroyed by a single injection of alcohol. It is Byrnes' opinion, however, that by repeated injections of the ganglion its complete destruction may finally be accomplished. Byrnes has treated fourteen patients; a little more than eighteen months have elapsed since the earliest injection. During this period six patients who were treated more than a year ago, are still free from pain—the longest period of relief being eighteen months. Four patients treated within the last twelve months of this period have had no return of pain. Three patients in whom only partial injections were obtained, returned for further treatment. (*Journ. Amer. Med. Association.*)

[*Lancet*, London, June 12, 1915.]

LAVAGE IN CARBOLIC ACID POISONING. Editorial.

[*Journal of the American Medical Association*, Chicago, July 10, 1915.]

SOME FALLACIES IN THE TREATMENT OF PHENOL (CARBOLIC ACID) POISONING. Editorial.

In carbolic acid poisoning lavage with various solutions has been recommended, and two substances, alcohol and sodium sulfate, have been particularly recommended, apparently on rational grounds. In the *Johns Hopkins Hospital Bulletin*, 1915, vol. xxvi, p. 98, Dr. D. I. Macht has published an important experimental investigation on this

subject, and has shown that alcohol is not only useless but injurious. Its use is due to a fallacious deduction from the fact that it is beneficial in carbolic acid burns. Alcohol was introduced as an antidote for carbolic acid in 1899 by Dr. S. D. Powell of New York, who used to demonstrate his view by washing his hands in pure carbolic acid and then in alcohol, and even by filling his mouth with the acid and quickly rinsing with 95 per cent. alcohol. Subsequently isolated cases were recorded as illustrations of the value of alcohol. With regard to the use of sodium sulfate, contradictory researches have been published. In the higher animals the first symptoms of carbolic acid poisoning are weakness and a peculiar muscular tremor. These are soon followed by clonic convulsions, collapse, coma, and death. There is very little pain, as the central nervous system is quickly paralyzed. Macht introduced liquefied carbolic acid, both in concentrated solution and in various dilutions, through a stomach tube into various animals, and washed out the stomach at different periods after the appearance of symptoms with solutions or suspensions of various substances, viz, egg albumin, alcohol, sodium sulfate, sodium sulfite, and syrup of lime. Albumin proved of little use, and sodium sulfite too poisonous. Lime-water and syrup of lime, recommended in the hope of forming an insoluble compound, were found unsatisfactory. In cats the success of lavage was found to depend on the amount of carbolic acid given, the time of lavage, and the solutions used. After small though lethal doses, washing out the stomach thoroughly with either plain water or a concentrated solution of sodium sulfate on the appearance of convulsions (three to five minutes after ingestion) saved the animals in most cases. Lavage with solutions of alcohol was followed by death more often than by recovery. After large doses of carbolic acid prompt lavage with alcohol was followed almost invariably by death; plain water also failed, but solution of sodium sulfate gave the best results, viz, survival for a time, or recovery. After later lavage with alcohol or plain water the animal invariably died, but after lavage with sodium sulfate it occasionally recovered. Dogs withstood carbolic acid better than cats, and could be saved by immediate lavage irrespective of the medium used. After larger doses immediate lavage with sodium sulfate or plain water sometimes saved the animal, while lavage with alcohol was almost always followed by death. Dr. Macht agrees with Tauber that sodium sulfate does not act chemically, but by hindering absorption and possibly also by purgation. Magnesium sulfate can be used for the same reasons, but the possible depressing effect of the magnesium ions in case of absorption is a disadvantage. Further experiments showed that animals which had previously been poisoned with alcohol withstood carbolic acid better than others. Possibly this was due to the greater affinity of the alcohol for the nerve cells, which prevented the carbolic acid from acting on them. On the other hand, alcohol given after ingestion of carbolic acid simply promotes absorption, as it is an excellent solvent of the latter. This is confirmed clinically, for of 10 cases mentioned by Falck in which carbolic acid was taken in various alcoholic drinks, 9 were fatal; whereas in 17 in which the acid was simply taken by mistake, 13 were fatal. The writer's point is important, for the recommendation of alcohol as an antidote to carbolic acid is to be found even in text-books.

The *Journal*, in commenting editorially on this important investigation, the substance of which it prints in outline, says, that naturally the question of first aid and suitable antidotes is of pre-eminent interest. When coma and collapse have set in and reached the point at which artificial respiration becomes desirable, there is little prospect of resuscitation. Everything hinges on early procedure, particularly the removal of an unabsorbed poison, whether it be in the stomach or on the exterior surfaces. Clinical statistics, together with this newer experimental evidence, suggest, despite the advice found in some of the prominent text-books on toxicology, that the use of alcohol in phenol poisoning should be strongly discouraged.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

SECTION I.—*Dental Anatomy, Histology, and Physiology.*

THE STAINING OF THE DENTAL AND ADJACENT TISSUES OF SOME RODENTS BY MEANS OF TRYPAN BLUE INTRODUCED INTO THE ANIMALS DURING LIFE.

By A. W. WELLINGS, L.D.S.Edin., M.D.S., Birmingham, England.

The recent developments of intra-vitam staining methods are largely due to the work of Ehrlich and others in chromotherapy.

Trypan blue is one of the benzidene series of anilin dyes. Its exact constitution is doubtful, hence it is impossible to represent it graphically. It is, however, a derivative of the condensation product of toluidin with amino-napthol-disulfonic acid.

Bouffard, of the Pasteur Institute, first described the appearance, macroscopic and microscopic, of the normal tissues of an animal under the influence of trypan blue.

Goldmann described and worked out the histogenesis of stained cells found everywhere in the connective tissue throughout the body. He called them pyrrhol cells and identified them with Maximov's "resting wandering cell," the rhagiocrine cell of Renaut, Metschnikoff's macrophage, and the adventitia cell of Marchand.

Up to the present time the effect of this dye upon the dental tissues has not been investigated, and it is with this object in view that the work here described is undertaken.

The developmental and mature tissues have been examined in rats, mice, and guinea-pigs, the dye being introduced into the animal subcutaneously, or intraperitoneally—0.01 gm. of color per 20 gm. body weight of animal. The dose is repeated at about eight-day intervals until the creature is in a high state of coloration. The animal is then killed, the tissues fixed in 10 per cent. formalin, and sections prepared as may be desired.

Examination of innumerable sections prepared in a great variety of ways disclosed appearances from which the following conclusions were drawn:

(1) It is possible to stain certain cells of the mature dental pulp and peridental membrane in the rodents mentioned by means of the intra-vitam application of trypan blue.

(2) Similar cells can be shown to exist in great numbers in the developing dentin papilla after calcification has commenced, all about growing bone, and in the connective tissue around the developing enamel, many of which lie closely to the cells of the stratum intermedium.

(3) The pulps of the teeth of persistent growth contain an exceptional number of stained cells. The matrix of dentin and bone is stained very lightly, the color disappearing quite soon. The walls of the dentinal tubules and the Haversian canals do not stain, neither do the dentinal fibrils, but the periosteum stains deeply.

(4) The secondary dentin formed in the center of the pulp cavity of persistently growing teeth stains deeply.

(5) Enamel developing at the time of the introduction of the stain and that formed while the stain is in the body takes on a very brilliant color, which subsequently fades as calcification progresses.

(6) It is not possible to stain already calcified enamel by means of trypan blue.

(7) The dye is distributed more or less through all the tissues of the mouth, the color being in the plasma in which the tissues are bathed and in certain specific cells of the connective tissue.

(8) These cells are identical with Goldmann's pyrrhol cells, and are distributed throughout the body except the nervous system.

(9) They have pronounced phagocytic powers, and possess the property of wandering about the body in an exceptional degree.

(10) They are concerned in inflammatory and other pathological conditions, and in reparatory processes.

(11) They may also be chemical and nutritional factors in body metabolism.

SECTION II.—*Dental Pathology and Bacteriology.*

A BIOLOGICAL THEORY OF DENTAL CARIES. By Dr. FEILER, BRESLAU.

The writer has ascertained by means of ground sections that defects in calcification in the enamel, interglobular spaces in the dentin, and transparency of the dentin are interrelated, inasmuch as they occur in combination as frequently as they occur singly. Evidently these phenomena are caused by vital processes in the enamel and the dentin. These observations lead to the postulate of a biologic theory of caries, viz, owing to a reduced formation of hard tissues during normal calcium salt consumption, the dental tissues are weakened and internal decalcification occurs. This reduced formation of hard tissues is due to disturbances in calcium metabolism of constitutional origin. Thus a predisposition is created for the activity of the acids and bacteria of the mouth, which have heretofore been generally regarded as the cause of dental caries. This theory also explains the heretofore obscure clinical phenomena, such as rapid caries during pregnancy and following certain dietary courses, and after influenza and constitutional disorders such as rhachitis; also the absence of caries when the body is overcharged with calcium salts, as in pyorrhea alveolaris.

SECTION III.—*Dental Surgery and Therapeutics.*

ETIOLOGY AND THERAPY OF PYORRHEA ALVEOLARIS. By Dr. JOSEF BODO.

The writer emphasizes the untenability of all the theories of pyorrhea alveolaris heretofore advanced, and points out that no theory is useful unless it fully explains all cases of the disease, and that it is not permissible to give different interpretations of one theory for different cases of a disease. He then discusses the contradictions in Karolyi's conception of the dynamic theory.

SECTION V.—*Dental Prosthesis.*

A SYSTEM OF REMOVABLE SADDLE BRIDGES. By OTTO RIECHELMANN, STRASSBURG.

Removable saddle bridges are indicated when the remaining abutments are not numerous or strong enough to carry fixed cantilever bridges, hence in such cases the bridge must be partly supported by a broad saddle resting on the gum. All abutments must be parallel. As means of fixation the writer employs spring pivots fitting in anchored tubes and saddle clamps embracing cylindrical crowns. In front teeth these tubes are anchored in the root-canals, in bicupsids and molars in special cylindrical crowns with flat cover, leaving sufficient room for a stout body of the bridge itself and a strong anchorage of the spring pivot soldered thereto. In close bite, saddle clamps are especially indicated, being anchored by swallowtail extensions in the heavy masticating surface of the abutment crown and firmly clamping the sides of the crown. For obtaining parallelism of the abutment teeth the roots may have to be reamed, using the writer's parallelometer for control. The uniform distribution of stress upon the abutments and the gum is obtained by intermediary members; the compensation between stress and release is secured by the writer's releasing bar.

SECTION VII.—*Oral Surgery and Surgical Prosthesis.*

THE PREDISPOSING CAUSES OF CLEFT PALATE AND HARE-LIP. By Dr. OSCAR A. STRAUSS, MILWAUKEE.

The subject is considered from a scientific and practical standpoint, and the results of tests which have been made upon animals and observed in human beings for a period of three years are presented. The animals upon which these tests were made are of the feline family, chiefly the jaguar, also the tiger and lion.

In considering the predisposing causes, it is attempted to prove how it is impossible to have an exciting cause produce a cleft palate without the predisposing cause being present.

The writer goes into the subject of catabolism and anabolism, also the consideration of the blood, showing various blood pictures, the systolic, diastolic and pulse pressure, and he also discusses in general the hereditary tendencies.

SECTION VIII.—*Anesthesia (General and Local).*

THE PNEUMO-ANESTHESIO-GRAPH. By Dr. FRANCHETTE, D.S.U.L., PROFESSOR AT THE DENTAL SCHOOL OF FRANCE.

The pneumo-anesthesio-graph is designed to register and estimate the amplitude and fre-

quency of the respiratory movements during anesthesia by ethyl chlorid, ethyl bromid, ether, or chloroform. This apparatus, though extremely simple, combines several accessories to the observation of anesthesia; it is timed to register one-fifteenth of a second, and permits of making an uninterrupted tracing during the entire duration of the anesthesia, indicating the frequency, amplitude, and rhythm of the respiratory movements.

SECTION IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

INDUSTRIAL DENTISTRY. By J. CHAS. STOREY, L.D.S., HULL, AND W. SHIREFF FINDLEY, L.D.S., HULL.

The writers give an account of the inception and carrying out of a scheme of dental care for the 3000 girls employed in the manufactories of Messrs. Reckitt's works at Hull. They describe the arrangement made with a local dentist personally to superintend the fitting-up of rooms and to supply an assistant six half-days weekly who worked for one year under his supervision. A description is also given of fittings and rooms. A nurse is in attendance, and a medical man is always present at the nitrous-oxid administrations. The table of operations shows a quarterly advance. The condition of the mouth has now become a factor in engaging workpeople, who must agree to having their mouths put in order. Tooth-brushes and powder are supplied, with instructions for their use. The original prejudice is being overcome, and satisfaction freely expressed by parents and patients. No extractions are made without an anesthetic, and no fee is charged for extractions or fillings. A mechanical laboratory is also provided, and low charges are made for prosthetic work. The increase of self-respect noted in the patients is an important factor.

THE LIVERPOOL DAY INDUSTRIAL SCHOOL CLINIC. By R. J. ERSKINE YOUNG, M.D.EDIN.

This clinic was started by the Liverpool Education Committee seven years ago (in July 1907), and therefore almost synchronous with Cambridge—the writer's appointment as dental officer dating from then. A serviceable equipment was provided, and work began forthwith.

First the teeth of all the day industrial school children were examined, and this survey has been repeated regularly since that time for the benefit of new children. "They are thus examined quarterly. Their dental requirements are entered in a register carefully. All children from five years are sent to the clinic alphabetically. They receive treatment beneficially."

The first molars are saved above all. The good results show in the physical, mental, and moral welfare of the child.

With every cavity filled, with every diseased tooth extracted, it is aimed to strike a deadly blow at possible tuberculosis—a fact which few private patients appreciate. Oral hygiene, no doubt, will help to diminish the death-rate, not only from tuberculosis, but other dread diseases as well.

THE NAVAL DENTAL SERVICE. By MR. EDWARD E. FLETCHER, L.D.S., CIVILIAN DENTAL SURGEON, R.N.

This paper shows the progress made during recent years in the effort to reduce dental and concomitant diseases among the British naval officers, men, and boys to a minimum, including references to the conditions of employment of the naval dental surgeons, their surgery equipment and stores.

The regulations are cited which govern the entry of boys and youths into the naval training establishments, and the methods adopted by the dental surgeons appointed to these establishments to render the boys and youths dentally efficient during their period of training.

A description is given of the routine adopted at the various naval hospitals and barracks for the treatment of officers and men of the fleet, and the other duties performed by the naval dental surgeons.

The writer further discusses the regulations governing the acceptance of recruits, and the means adopted to persuade the men to receive necessary dental treatment, also the steps that are taken with men who refuse to receive treatment when necessary.

PUBLIC DENTAL HYGIENE IN NORWAY. By DR. O. SMITH-HOUSKEN, CHRISTIANIA.

After the Berlin Congress of 1910, the work for the treatment of the teeth of the children in the public (common) schools received a fresh impetus. On November 1, 1910,

the first dental clinic of Norway was opened in Christiania; shortly afterward at Drontheim, subsequently at Bergen and several other towns, and in one country municipality, Aker.

All the clinics are municipal and subjected to the school boards. The working expenses everywhere are paid by the municipal authorities, so that the treatment is free to all children. At all the clinics the beginning is made with the lower forms, going upward in the school, and advancing annually by forms. On June 1, 1911, was founded the Norwegian Association for the Prevention of Dental Diseases. A number of town and country municipal boards are entered as members, also official sick clubs, school boards, etc. The association receives an annual grant from the government. By the aid of the association there has been published "Dental Caries at the Age of Conscription," by Mr. Arentz, a captain in the sanitary service, in competition for a prize offered by the Military Medical Society. Recruits numbering 8512 from different parts of the country were examined by the military doctors; only 5 per cent. had perfect teeth. On an average 11.4 teeth per individual were found to be damaged at the age of twenty-one. The Public Sick Assurance (a government and municipal institution) since its establishment is giving free extraction of teeth to its members. In accordance with the resolution of the Storthing (parliament) of the present year, aid may also, under certain conditions, be granted for the filling of teeth. The government has commenced to appoint dentists at the schools for the abnormal and at the lunatic asylums.

Section X.—*Dental Education.*

MEDICAL AND SURGICAL TEACHING FOR DENTAL STUDENTS. By Dr. D. Douglas-Crawford, Liverpool.

After criticizing the neglect in the teaching of dental students in the past, the writer contends that the increasing numbers of students demand special consideration. No attempt must be made in any projected reform to lower the standard of efficiency. The evidence of failure of teaching is seen in the excessive "coaching" in general subjects. There are, in the author's mind, many objections to a double qualification in medicine and dentistry. The chief necessity is to supply efficient dental surgeons to cope with the increasing demand. The period of study has so far been inadequate, and the teachers have failed to recognize the needs of dental students. The writer then gives a critical review of the teaching of general subjects in the Medical Faculty of Liverpool, and gives suggestions for reducing the period of study in various subjects. A plea is made for increased supervision of the students' work. The profession, it is claimed, is capable of effecting the necessary reform, either with active co-operation by teachers from the medical faculty, or, if necessary, independently.

PERISCOPE.

Removal of Fractured Roots.—There sometimes occurs an unavoidable fracture during extraction of a bent root—often the apical half or third of the palatal root of an upper molar, or perhaps of one of the roots of an upper first premolar. If the portion remaining high up in the socket should happen to be greatly loosened (a frequent occurrence), it is rather annoying to have to leave it and confess to an incomplete extraction, when the removal would be so very easy, if only one could get the least grip. In these cases I have sometimes found an absolutely new, sharp, spirally barbed broach, inserted into the exposed pulp canal with a gentle screwing motion, very useful. If a "cleanser" be chosen of a size that will only just with difficulty enter the canal, its barbs will bite into the dentin quite strongly enough to allow of the withdrawal of the loose fragment with a careful and straight pull.—E. Holman, *Brit. Dental Journal.*

Facilitating the Management of Patients with Full Mustaches.—Patients with full mustaches are often difficult to work for, on account of the mustache shutting off the light. To prevent this, a piece of linen, about an inch wide, is fastened with the rubber dam holder across the lip.—*Austral. Journ. of Dentistry.*

Precaution Against Accidental Specific Infection During Dental Operations.—Any wound or abrasion incurred in a dental operation should be held suspect, and vigorous antiseptic treatment should be applied at once, expert advice being sought at once in any doubtful or slowly healing lesion, in which it is often easy to detect the spirochæta pallida. I always give the advice to clinic operators, if they have a sore not healed at once under the usual antiseptic treatment, to have it examined to see if there are any spirochetes, and to start treatment before becoming generally infected.—J. H. Sequeira, *Brit. Dental Journal.*

Judgment the "Sine qua non" in Nitrous Oxid and Oxygen Administrations.—No apparatus for administering nitrous oxid and oxygen has been devised so far, nor can one ever be devised, which is automatic, or foolproof, or which can be set to suit all cases; for each patient is a law unto himself, and requires his own adjustment of the two gases —and even that adjustment may have to be changed during the administration. I would suggest that in the curriculum of every dental college a practical course for nitrous oxid anesthesia be incorporated, to the end that every graduate may be proficient in the use of this agent.—L. Schultz, *Dental Review.*

Color Considerations in Selecting Artificial Teeth.—The following factors must be taken into account and guarded against if we would make successful matches of color in selecting artificial teeth. A bright object appears brighter when put alongside of a darker one, and *vice versa.* And just as an object that is placed alongside of red takes on a greenish tinge, so the human teeth appear greenish when seen surrounded by the healthy red tissues of mouth and lips. Thus teeth that in themselves are of a decidedly orange hue, will often appear greenish yellow as a result of their being surrounded by very red tissues. In short, the factor of negative afterimages and simultaneous and successive contrast tends to make the teeth appear of a different hue and a different brightness when inside and when outside the mouth.—F. H. Orton, *Journ. Allied Dental Societies.*

Early Phenomena in Mouth and Throat During Prodrome of Smallpox.—K. Walko, in charge of the contagious disease hospital at Ujvidek in the eastern zone of war, has been making a special study of the behavior of the mucous membrane in the mouth and throat to ascertain whether something analogous to Koplik's spots in measles might not be discovered. In three cases, during the period of incubation or the prodrome, there were pronounced findings on the mucosa, beginning as a diffuse redness and swelling, and then brighter red spots developed at various points. This red spotting persisted during the whole of the disease or developed into actual superficial ulcers. The participation of the buccal and throat mucosa in the active disease process is not only an aid in diagnosis, but it also suggests that droplet infection may occur even during the incubation or prodromal period. One physician contracted smallpox from a patient who coughed while he was being examined. The physician had not touched him or any article in the room, but eight days after this visit the symptoms of the disease became manifest.—*Prager Med. Wochenschrift*, per *Journ. Amer. Med. Association.*

Diagnosis of Pulp Gangrene.—Gangrene of the pulp necessitates microbic infection of the necrotic tissue. It is immaterial whether the infection reaches the dead pulp through a cavity or via the circulation. Its diagnosis is based on practically the same points as necrosis, with this important addition—an intense foul odor, and if there is no opening into the pulp chamber, more or less severe swelling of the gum and the surrounding tissue, often including a part of the face, and pain. In fact, the pathological picture often presents a diffuse purulent pericementitis or periosteitis. There is no response to the electric current except in such cases as where necrobiotic changes are still going on, viz, where a part of the pulp may still show vital reactions. These possibilities are primarily found in multi-rooted teeth. Gangrene always presents a semi-liquid mass of dirty, grayish, or black débris, with the typical putrescent odor, due to the formation of hydrogen sulfid, ammonia, fatty acids, and other odoriferous compounds. The autolytic dissolution of the dead pulp tissue is caused by the action of the ferments liberated from the leucocytes; the bacteria only play the rôle of important biological agents in this process. The so-called dry gangrene differs from moist gangrene in so far as it is *not* gangrene, but mummification necrosis.—H. Prinz, *Dental Summary.*

Procedure in Alveolar Abscess Pointing on the Face.—Sometimes the patient is not seen until pus has reached the skin and is about to point following ineffectual attempts to discharge it in the mouth. If such an abscess is permitted to open on the face without surgical assistance, a disfiguring scar results which might have been avoided by external incision.

Prior to external incision the skin should first be cleansed with soap and water and then with 50 per cent. alcohol, or the surface painted over with tincture of iodin. After the skin has been incised, if the pus is deeply located, a blunt dissection should be made into the pus pocket, since there is less danger of injuring important structures by this method than if made wholly by the knife. If the pus pocket is deep, some sort of drainage is desirable. Fenestrated rubber tubes or gutta-percha tissue may be employed. The whole of the affected area should be covered with a number of thicknesses of gauze wrung out of a hot boric solution, which dressing should be frequently renewed. The dressing should be covered with rubber dam, oil silk, or gutta-percha tissue, and supported by a suitable bandage, and the patient put to bed. Following the free evacuation of pus the fever and the other symptons usually promptly subside.—T. L. Gilmer, *Dental Review.*

Chin Plates of Celluloid in Fractures of the Mandible.—A good impression is taken of plaster or modeling compound, reaching to the lower lip above, to the neck line below, and to the angles of the rami laterally. From this impression a plaster cast is poured and coated with talcum to prevent sticking of the celluloid. A plate of black celluloid of from 0.5 to 1 mm. thickness is softened in acetone and adapted to the model. A strong cloth ribbon of 2 cm. breadth and 25 cm. length is laid over the neck margin of the plate and covered with a layer of softened celluloid, the ends of the ribbon to protrude on either side so that other ribbons can be sewed to them to be fastened over the vertex and the occiput. In adapting the celluloid plates to the model, rubber gloves are worn, which are repeatedly moistened in acetone. The acetone requires from 15 to 24 hours to evaporate. The chin plate is then removed from the model, the model is once more coated with talcum, and the plate readjusted and covered with a layer of cotton, to be fastened by a gauze bandage so as to prevent distortion. The plate will be quite hard after drying in a warm place for twelve hours. All rough portions are smoothed by wiping with a linen cloth dipped in acetone. Celluloid plates are not attacked by saliva or secretions from wounds.—Port, *Deutsche Zahnaerztl. Wochenschrift.*

Classification of Malocclusions Caused by Supernumerary Teeth.—In order to have a clear picture of the various malocclusions caused by supernumeraries, the following more or less complete classification of these malocclusions will illustrate their variety and degree of complexity, as well as serve as an index to the treatment of a number of special cases which will follow somewhat along the lines of this classification: (*a*) Malocclusion with perfect alinement of normal teeth and supernumeraries. (*b*) Labial or buccal displacement of normal teeth by supernumeraries. (*c*) Mesial or distal displacement of normal teeth by supernumeraries. (*d*) Torsional displacement of normal teeth by supernumeraries. (*e*) Transposition of normal teeth through the eruption of the supernumeraries. (*f*) Impaction of normal teeth by supernumeraries. (*g*) Combinations of the preceding variations of tooth displacement. (*h*) Existing malocclusions involving tooth displacement by supernumeraries. (*i*) Broadening of the entire front of the dental arch through the presence of supernumeraries. (*j*) Presence of supernumeraries in the arch and the absence of corresponding normal teeth. (*k*) Fusion of supernumeraries to other teeth.—H. A. Pullen, *Internat. Journ. of Orthodontia.*

The White Operating-room Fad.—There has never been a satisfactory excuse given for the almost exclusive use of white in the surgery and clinic room, except that it is supposed to stand for sanitation and cleanliness. There are, probably, few operations producing greater eyestrain than those which the dentist performs daily, and few workers, as a class, are subject to greater continuous nervous tax than dentists; in no room is the subject of lighting more important than in the dental operating room. The white operating room is a fad, and, all things considered, is an injurious farce. The patient, always squarely facing the light, has the added discomfort of dazzling reflections from every corner; the operator receives the glare from every direction through which his straining eyes must penetrate, often to the most remote and inaccessible places, which is an additional strain to the general nerve tension and irritability of both operator and patient.

The appearance as well as an actual condition of sanitation and cleanliness, can be maintained just as satisfactorily, an artistic

sense of beauty and refinement can be more fully satisfied, and a potent influence for general comfort may be obtained by the use of any light color or combination of colors aside from the pure white, in rooms used for surgical purposes. Any color just off white, as light cream, light green, or any of the shades of gray, will relieve the eyestrain and materially add to the comfort of both dentist and patient, besides giving tone and beauty to the room.—Editorial, *Northwest Journ. of Dentistry.*

Obituary.

DR. JAMES BRANSTON WILLMOTT.

[See Frontispiece.]

Died, June 14, 1915, in Toronto, Canada, from gastro-intestinal obstruction, James Branston Willmott, D.D.S., LL.D., in his seventy-eighth year.

The father of professional dentistry in Ontario, Dr. J. B. Willmott, dean of the Royal College of Dental Surgeons of Ontario, died at the General Hospital, Toronto, at 4.30 p.m., June 14th, at the age of seventy-eight. Dr. Willmott was taken ill two weeks previously with an ailment of the stomach, and though every effort was made by city surgeons, it was realized from the first that there was little hope of recovery. Up to that time Dr. Willmott, true to the traditions of his lifetime of hard work, had been busy at his profession.

The life-history of James Branston Willmott would be the story of the development of dental education within the Dominion of Canada. The dental profession in Ontario was incorporated in 1868 as the Royal College of Dental Surgeons, and the profession used to meet annually and elect a board of directors which controlled the destinies of dentistry in the province. Dr. O'Donnell of Toronto was the first secretary of the Royal College, holding that position for three years following the incorporation in 1868. Then Dr. J. B. Willmott took the secretaryship, and held the position up to the time of his death.

Not until 1870 did the late Dr. Willmott come from his native town of Milton to live in Toronto. During the first year of his secretaryship of the Royal College of Dental Surgeons he was a practicing dentist in Milton. In 1874 and 1875, at the request of the board of the Royal College, he established a class of instruction for dental students, and in the fall of 1875 the same board organized a school of dentistry with Dr. Willmott as dean. Dr. Willmott and Dr. Luke Teskey were the first staff of the new school. For two years these two men carried on the courses in the school of dentistry, and then Dr. W. T. Stuart was added to the staff. The next addition was not made until 1889, when Dr. J. B. Willmott's only son, Dr. W. E. Willmott, became the fourth lecturer.

A new era in the development of dental education in Ontario was reached in 1892, when the school of dentistry was entirely reorganized. In 1888 the school had been affiliated with the University of Toronto, largely through the efforts of Dr. Willmott and Vice-chancellor Mullock. But until 1892 the institution had been practically owned by the three gentlemen who composed the staff, Drs. Willmott, Teskey, and Stuart. They received fees from the students, and out of this revenue ran the school. In 1892, however, it was taken over by a board of directors. From that time the school of dentistry in Toronto has progressed, and to-day is reputed all over America for its high standard of education.

The first dental act of 1868, incorporating the Royal College of Dental Surgeons, was regarded as one of the best dental acts in existence on any statute-book. And since then several changes have been made in the act, but always with the result of maintaining the high level of the original legislation. Dean Willmott's presence on the senate of the University of Toronto, which position he

held from the year 1888, when the school of dentistry was affiliated with the university, was regarded by his associates as a valuable influence in all discussions pertaining not only to affairs of dentistry, but also to other departments of educational work.

The late Dean Willmott was born on a farm two miles from the town of Milton, seventy-eight years ago. He received his primary education at Milton, and with the idea of taking a full course in arts, he entered Victoria University with the old class of 1856, but he abandoned his course before finishing his first year on account of ill health. He returned to Milton, and after taking up dentistry under the direction of the late Dr. W. C. Adams of Toronto, started to practice for himself in May 1858. Before settling in Toronto he went to Philadelphia for one year and was graduated from the Philadelphia Dental College.

Dr. Willmott, in September 1864, married Margaret Bowes of Milton. She and their only child, Dr. W. E. Willmott, survive him.

Last June the University of Toronto conferred the distinction of LL.D. upon Dr. Willmott, an honor which is not shared by any other Canadian dentist. He was also the only representative of the profession in Canada to be an honorary member of the British Dental Association. He was also the first president of the Canadian Dental Association, and a constant adviser of the Dominion Dental Council, which was organized a few years ago in Montreal at the same time as the Canadian Dental Association. For fifty-three years he had been an official member of the Methodist Church, and for thirty-five years a member of the board of trustees of the Metropolitan Church, of which for twenty-one years he was treasurer.

The influence of Dr. Willmott as a wise counselor in educational matters was exerted and felt beyond the limits of the Dominion of Canada, for as a representative of its educational interests in the National Association of Dental Faculties of the United States his voice was impressively raised at all times in favor of high standards and progressive ideals. His judgment was sound in all matters pertaining to his profession, and his unimpeachable integrity and honesty of purpose gave weight and importance to his advice on all educational topics. He was distinctly a leader whose power grew out of the example which his long and successful professional career furnished to those to whom he was guide and friend.

DR. SAMUEL S. NONES.

Died, at his home in Narbeth, Pa., June 10, 1915, from Bright's disease, Samuel Smith Nones, D.D.S., in his seventy-ninth year.

Dr. Nones, the son of Captain Henry B. Nones, U.S.N., and Anna H. Nones, was born at Staten Island, New York, April 22, 1837. He studied dentistry at the Pennsylvania College of Dental Surgery, from which institution he was graduated March 1, 1859, and entered upon the practice of his profession in Wilmington, Del., continuing in practice there until 1864, when he removed to Philadelphia, where he practiced until shortly before his decease.

Dr. Nones was twice married, first to Miss Harriet Alexander Hodgson of Wilmington, January 15, 1863, who died May 8, 1882, and second, to Miss Elizabeth Cooper, September 29, 1885, who died August 17, 1907. By his first marriage he had two sons, Drs. Robert H. and Henry B. Nones, and one daughter, Mrs. Ida Wiley; by his second marriage, one son, Albert C. Nones. Both Dr. Nones' sons by his first marriage are practitioners of dentistry, and one grandson is also a dentist, making three generations of dentists in unbroken descent up to the decease of the subject of this sketch.

Dr. Nones was a skilful practitioner, quiet and modest in manner, who gained and kept the confidence of his *clientèle* by the thoroughness of his work and by his amiable personality.

He was a charter member of the Pennsylvania State Dental Society. His remains were interred June 12, 1915, at Wilmington.

"IN MEMORIAM" RESOLUTIONS.

Dr. Eugene A. Johnson.

The committee appointed by the Memphis (Tenn.) Dental Society to prepare an expression of their sense of the loss sustained by the death of Dr. Johnson, reported and the society adopted the following:

Whereas, it has pleased our God the manager of all things to remove Eugene A.

Johnson by death: The commonwealth has lost a worthy citizen of the highest type, and our profession an eminent and highly respected member, who throughout his career was ever among the foremost in working for the advancement of his fellow men.

Dr. Johnson was an earnest worker for the higher ideals in dentistry. He was an earnest and forceful teacher, and was highly appreciated by his *confrères* in the faculty of the University of Tennessee College of Dentistry, with whom he had been associated for several years.

In all professional and society work both his counsel and his ability to perform were greatly appreciated. By his death the Memphis Dental Society feels that it has sustained an irreparable loss. Therefore,

Resolved, That we hereby give expression to our sorrow and feelings of the sad loss caused by the sudden culmination of this brother's noble career. We also desire a copy of this expression of regret be sent to the bereaved family, and to the journals for publication.

J. D. Towner,
D. M. Cattell,
Committee.

Dental Legislation.

Arkansas Dental Law.

An Act

To Amend No. 157 of the Acts of 1901, entitled An Act to Regulate the Practice of Dentistry and Dental Surgery in the State of Arkansas, approved May 23, 1901.

Be it enacted by the General Assembly of the State of Arkansas:

Be it enacted by the People of the State of Arkansas:

Section 1. That the Arkansas State Board of Dental Examiners heretofore created be continued, to consist of five (5) practicing dentists, whose duty it shall be to carry out the purposes and enforce the provisions of this act as hereinafter specified. Members of the said board, who shall be known and styled "The Arkansas State Board of Dental Examiners," shall be appointed by the Governor of the State of Arkansas; such appointments to be recommended by the Arkansas State Dental Association, and all of whom shall be graduates of a reputable dental college, or the dental department of a reputable college or university; must be residents of the state for a period of five (5) or more years; must be legally licensed to practice dental surgery or dentistry, and must have been actually engaged in the practice of dentistry immediately preceding their appointment for at least five (5) years; *provided, however,* that no person shall be eligible to appointment on the said board who is in any way connected with, or interested in, any dental college, or the dental department of any institution of learning, or the dental supply business.

The terms for which the members shall hold office shall be five (5) years; *provided,* that the present members of the said board in office at the time of the passage of this act shall continue in office until their respective terms expire, and until their successors are appointed and qualified.

On September 1, 1915, the Governor shall appoint five (5) men recommended by the Arkansas State Dental Association, in open and regular meeting, with qualifications as specified elsewhere in this act, who shall constitute the State Board of Dental Examiners. The appointments of the same to be made as follows: One member shall be appointed for one (1) year; another for two (2) years; another for three (3) years; another for four (4) years; another for five (5) years; and on September 1st annually thereafter the Governor shall appoint one member of the said board recommended by the Arkansas State Dental Association in open and regular meeting, whose term of office shall be for five (5) years.

All vacancies on said Board of Dental Examiners shall be filled by the Governor to

serve for the unexpired term of the member whose place upon the said board is rendered vacant.

SEC. 2. *Officers' meetings — Records, etc.* Said Board of Dental Examiners shall choose one of its members as president and one as secretary-treasurer thereof at each annual meeting to be held between the fifteenth (15th) day of May and the fifteenth (15th) day of July each year. Said board may meet oftener, if necessary in the discretion of the board, at such times and places as it may deem proper, for the examination of applicants who may wish to practice dentistry in this state, and for the transaction of any other business that may come before it. Said board shall keep a record-book in which shall be registered the names, addresses, and license numbers of all persons legally entitled to practice dentistry in the State of Arkansas. A majority of the members of said board shall at all times constitute a quorum for the transaction of business, and proceedings of said board shall be recorded in a minute-book open at all reasonable times to public inspection. The secretary-treasurer shall execute to said board a bond with approved security for the faithful performance of his duty.

SEC. 3. *Granting license, registration, etc.* No person shall practice dentistry in the State of Arkansas or attempt to do so after the passage of this act, without first applying for and obtaining a license for such purpose from the State Board of Dental Examiners, and registering such license as herein provided, and this provision shall apply to all persons, whether they have heretofore practiced dentistry in this state or not, except such persons as have been heretofore licensed and registered. Application for license shall be made to the said board in writing, and shall, in every instance, be accompanied by an examination fee of fifteen ($15.00) dollars, which sum it is authorized to charge each applicant for each examination by said board. The applicant must be at least twenty-one (21) years of age, of good moral character and reputation, and the application of each person seeking a license must be accompanied by evidence satisfactory to said board that the applicant so applying is a graduate of, and has a diploma from, a reputable dental college, or the dental department or some reputable school or university.

Examination must be both written and clinical, and of such a character as to thoroughly test the qualification of the applicant to practice dentistry, and the applicant in his examination must make a grade or percentage required by the board which shall not be less than an average of seventy-five (75 per cent.) per cent., and the board may also, in its discretion, refuse to grant license to any person found guilty of making false statement, of cheating, or of fraud or deception, either in applying for license or taking said examination.

SEC. 4. *Registering license—Fee.* Any person licensed to practice dentistry or dental surgery in this state by the Arkansas State Board of Dental Examiners, as hereinbefore provided, shall personally and within ninety (90) days from the day of issue, cause such license to be registered with the county clerk, or county clerks, of such county or counties in which such person desires to engage in the practice of dentistry or dental surgery, and the county clerks of the several counties of this state shall charge for registering such license a fee of fifty (50c) cents for each registration. And, it is hereby provided further that every person who engages in the practice of dentistry or dental surgery in this state shall cause his or her license to be registered with the county clerk before beginning the practice of dentistry in said county, and to be at all times displayed in a conspicuous place in his or her office wherein he or she shall practice such profession, and shall further, whenever requested, exhibit such license to any other members of the said board, or its authorized agent.

SEC. 5. *Duty of county clerk.* The county clerk of each county shall furnish annually before the first day of December of each year, to the State Board of Dental Examiners, upon blanks to be provided by such board, a duplicate list of all certificates received and issued by him during the preceding year, and shall include therein the date and issue of said certificate, the serial number, the name, the age and the residence of each person receiving the same.

SEC. 6. *Failure to register license—Forfeiture.* Any failure, neglect, or refusal, on the part of any person obtaining a license to practice dentistry or dental surgery from the said board, to register said license with the county clerk of some county of this state, as above directed, within ninety (90) days from the date of the issue of the same, shall work a forfeiture of such license, and no license when once forfeited shall be restored, except upon payment to the said board of the sum of fifteen ($15.00) dollars for such neglect, failure, or refusal to register such license, and the surrender of the forfeited license.

Sec. 7. *Revocation of license.* The State Board of Dental Examiners may refuse license or suspend or revoke the same for any of the following causes:

First—The presentation to the board of any diploma, license, or certificate, illegally or fraudulently obtained, or one from an institution which is not reputable, or from an unrecognized or irregular institution or state board, or obtained by the practice of any fraud or deception.

Second—The publication or the circulation of any fraudulent or misleading statement as to the skill or method of any person or operator.

Third—The commission of a criminal operation, or conviction of felony, or chronic or persistent inebriety, or drunkenness, or confirmed drug habit, or in any way advertising to practice dentistry or dental surgery without causing pain, or advertising in any other manner with the view of deceiving or defrauding the public, or in any way that will tend to deceive the public, or in using or advertising as using any drug, nostrum, or patent proprietary medicine of any unknown formula, or any dangerous or unknown anesthetic which is not generally used by the dental profession, or using or advertising as using any drugs, material, medicine, formula, system or anesthetic which is either falsely advertised, misnamed or not in reality used.

Fourth—The employment in the practice of dentistry of any unlicensed person; the violation of any of the provisions of this act, or the refusal to comply with any of the said provisions.

Nor shall said Dental Board re-license anyone whose license has once been revoked for any of the above causes within one year after such revocation, and only then upon sufficient assurances and guarantees to the said board of correct conduct for the future. A second revocation of any license shall be perpetual.

Sec. 8. *Proceedings and authority of the board.* In all proceedings for a suspension or a revocation of license, the holder of said license shall be given thirty days' notice to prepare for hearing, and he shall be heard in person, or by counsel, or both. The State Board of Examiners may take such oral or written proof, for or against the complainant, as it may deem will best present the facts. It may also employ an attorney, if it deems it necessary, in special cases. Said board shall have full power to make any by-laws and necessary regulation for the fulfilment of their duties under this act.

Sec. 9. *Examination fee—Compensation—Secretary's salary—Expense report.* In order to provide the means of carrying out and enforcing the provisions of this act, said board shall charge each person applying to it for examination for a license to practice dentistry or dental surgery in this state, an examination fee of fifteen ($15.00) dollars, and out of the funds coming in possession of the board under the provisions of this act, the members of said board shall receive as compensation the sum of eight ($8.00) dollars for each day actually engaged in the duties of the office, and shall be reimbursed for all legitimate and necessary expenses incurred in attending the meeting of said board; *provided*, that the secretary of the board, for the purpose of enforcing the provisions of this act, shall receive a salary to be fixed by the board not to exceed twenty-five ($25.00) dollars per month, instead of the *per diem* of eight ($8.00) dollars. All expenses shall be paid from the fees, fines, and penalties received and recovered by the board under the provision of this act; and no part of said expense shall be paid out of the state treasury. All money received in excess of said *per diem* allowance and other expenses herein provided, shall be held by the secretary of the said board as a special fund for meeting expenses of said board, and said board shall submit an annual report of its proceedings to the Governor by the fifteenth (15th) day of December of each year, together with an account of all money received and disbursed by them pursuant to this act, and shall submit a like report and account annually to the Arkansas State Dental Association.

Sec. 10. *Disposition of fees and fines in excess of expenses.* One-half of all money received in excess of said *per diem* allowance, and all other expenses herein provided for shall be held by the secretary-treasurer of said board as a special fund for such use as the said board may deem necessary in the enforcement of this act, and one-half of said excess so received shall be paid over by the said board to the public school fund of the State of Arkansas.

Sec. 11. *Certificate of registration—Renewal of—and Notice.* For the purpose of correcting and revising the register of legal practitioners of dentistry, as kept by the State Board of Examiners, it shall be the duty of each person registered, or licensed, by the board to practice dentistry in this state, to procure from the secretary of the board on or before November 1, 1915, and on or before November 1st annually thereafter, a certificate of registration; such certificate shall be issued by the secretary of said board upon payment of the fee of one ($1.00) dol-

lar. All certificates so issued shall be *prima facie* evidence of a right of the holder to practice dentistry in this state during the time for which they are issued, and the same shall be exposed to public view in the operating room of the holder. Any certificate or license heretofore granted, or that may be hereafter granted by the board, shall be cancelled if the holder thereof fails to secure renewal of the certificate herein provided for within a period of six months after November 1, 1915, and annually thereafter, *provided*, that the license or certificate thus cancelled may be restored by the board upon payment of fee of fifteen ($15.00) dollars without further examination of the holder as to his competence and ability to practice. It shall be the duty of the secretary of the board to mail, on or before October 1, 1915, and on or before the same date annually thereafter, to each person whose name appears on the register of the said board a printed blank form, to be properly filled out by the holder of such license or certificate and returned by such holder to the secretary of the board, together with a fee of one dollar.

SEC. 12. *Exemption from service as jurors.* That all dentists or dental surgeons now legal practitioners of dentistry or dental surgery of this state, or those who may hereafter become such, shall be exempt from service as jurors in any of the courts of this state.

SEC. 13. *Unlawful practice under the name of a company.* It shall be unlawful for any person or persons to practice or offer to practice dentistry or dental surgery under any name except his or her own name, or to use the name of company, association, corporation, or business name, or to operate, manage, or be employed in any room or rooms, or office, where dental work is done, or contracted for, under the name of any company, association, trade name, or corporation. Any person, or persons, practicing or offering to practice dentistry or dental surgery shall practice under and use his or her name only.

SEC. 14. *Board may license dentists from other states—How and when.* Any dentist who has been lawfully licensed to practice dentistry or dental surgery in another state or territory, which has and maintains a standard of proficiency equal to that now maintained in this state under the provisions of this act, and who has been lawfully and continually engaged in the practice of dentistry or dental surgery for five years next preceding the filing of his application, and is desirous of moving to this state, and shall deposit in person with the secretary of the State Board of Dental Examiners a duly attested certificate from an examining board of the state in which he or she is registered, certifying the fact of his or her registration, and his or her good moral character and professional attainments; upon the payment of a fee of twenty-five ($25.00) dollars may, at the discretion of the State Board of Dental Examiners, be granted a license certificate, to practice dentistry in this state; *provided, however*, that no license shall be issued to any such applicant unless the state or territory issuing the certificate to such applicant shall have extended a like privilege to engage in the practice of dentistry or dental surgery within its own borders, to dentists heretofore and hereinafter licensed by this state and removing to such other state.

SEC. 15. *Board may issue certificate to practice in other states—When.* Any person of good moral character who is a legally registered and practicing dentist in this state for a period of five years preceding his or her application for a certificate hereinafter described, and who is known to the Board of Dental Examiners of this state, on the payment of a fee of five ($5.00) dollars, will be entitled to receive a certificate attested by the signature of the president and secretary of said board, which certificate shall state that the holder thereof is a person who has been duly licensed to practice dentistry in the State of Arkansas; that he or she is a person of good moral character and professional attainments; that he or she has been engaged in the practice of dentistry or dental surgery continuously for five (5) years prior to his or her application for certificate, and that he or she intends, at the time of his or her application for a certificate, to engage in the practice of dentistry in a state other than the State of Arkansas; *provided*, that all such certificates so issued shall be like in tenor and form; *provided, further*, that the refusal of any state or of its appropriate officers to fully honor such certificate shall constitute a forfeiture by such state of all courtesies and privileges extended under this act.

SEC. 16. *License and how signed.* All licenses issued by said Board of Dental Examiners shall bear a serial number, the full name of the applicant, the date of the issue, and the seal of the board, and shall be signed by all members of said board, and be attested by the president and secretary.

SEC. 17. *Practicing dentistry without license—Penalty.* Any person who shall practice, or attempt to practice, dentistry or dental surgery within the State of Arkansas, without having been registered or licensed for that purpose, or during the period of suspen-

sion or revocation of the license previously granted, or who shall violate any of the provisions of this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than fifty ($50.00) dollars, nor more than two hundred ($200.00) dollars, or shall be imprisoned in the county jail not less than one month nor more than one year, or shall be punished by both such fine and imprisonment. Each act of practice or attempt to practice dentistry under the disabilities described in this section shall be deemed a separate offense within the meaning of this act. And each day on which any person shall hold himself out as practicing under any name except his or her own, shall be deemed a separate offense. The opening of an office for the purpose of practicing dentistry or dental surgery, or announcing to the public in any way the readiness to do any act defined herein as practicing dentistry, shall be considered as engaging in the practice of dentistry within the meaning of this act. It shall be the duty of the prosecuting attorney of the district in which such offense shall occur to prosecute every case to final judgment whenever his attention shall be called to a violation of this act. All fines collected under the provisions of this act shall be paid to the secretary-treasurer of the Arkansas State Board of Dental Examiners, and this money shall be used as hereinbefore stated.

Sec. 18. *Physicians, etc., exemption—When.* Nothing in this act shall prevent a legally qualified and licensed physician or surgeon, unless he practice dentistry as a specialty, from extracting teeth, or a legal practitioner of another state from making a clinical demonstration before a dental society or at a convention or dental college, nor shall this act prevent students from practicing or performing dental operations under the supervision of competent instructors in any dental college or dental department of any school or university recognized by the Arkansas State Board of Dental Examiners.

Sec. 19. *Druggist may fill dentists' prescriptions.* Legally licensed druggists of this state may fill prescriptions of legally licensed dentists of this state for any drug necessary in the practice of dentistry.

Sec. 20. *Lost license.* If the license herein provided for is lost or destroyed so that the same cannot be exhibited as provided for in Section 5 hereof, the person entitled thereto shall make written application to the secretary of the board for re-issuance of the same, under affidavit setting forth that such license is lost or destroyed and the circumstances under which such loss or destruction occurred, and upon receipt of such satisfactory application and affidavit, the secretary shall issue to the said applicant a duplicate license, for which there shall be paid a fee of one ($1.00) dollar.

Sec. 21. *Penalties for fraud.* Any person filing or attempting to file as his own the diploma or license of another, or a forged false affidavit of identification, or qualification, shall be deemed guilty of a felony, and upon conviction thereof shall be subject to such fine and imprisonment as are imposed by the statute for the crime of forgery.

Sec. 22. *What constitutes a reputable dental college.* No dental college shall be considered as reputable by the Arkansas State Board of Dental Examiners unless it possesses the following qualifications:

First—It shall be chartered under the laws of the state in which it is located and operated, and shall be authorized by its charter to confer the degree of "Doctor of Dental Surgery" or "Doctor of Medical Dentistry."

Second—It shall deliver annually a full course of lectures or instructions by a competent faculty or corps of instructors on the following subjects: Anatomy, chemistry, physiology, histology, materia medica, therapeutics, dental metallurgy, pathology, bacteriology, operative dentistry, prosthetic dentistry, crown and bridge work, orthodontia, oral surgery, oral hygiene, and the administration of anesthetics. Said courses of instruction shall consist of not less than three terms in separate academic years and of not less than thirty-two (32) weeks of six days each for each term.

Third—It shall possess apparatus and equipment adequate and sufficient for the ready and full teaching of the above named subjects.

Fourth—It shall be recognized as being reputable by the Board of National Dental Examiners before being recognized as such by the Arkansas State Board of Dental Examiners.

Sec. 23. *Members of board removed—When and how.* The Governor shall be empowered to remove from office any time any member of the said Dental Board for continued neglect of duty required by this act, or for incompetency, or unprofessional or dishonorable conduct.

Sec. 24. *Dentistry defined.* Any person shall be regarded as practicing or attempting to practice dentistry, within the meaning of this act, who acts as manager, proprietor, or conductor of a place for performing dental

operations, or who, for a fee, salary, or other reward paid to or to be paid to him or her, or another person performing dental operation of any kind, shall use the word "Dentist," or "Dental Surgeon," the letters "D.D.S.," or any other letter or title in connection with his or her name, which in any way represents him or her as being engaged in the practice of dentistry or dental surgery, or who shall diagnose or profess to diagnose, or examine and contract for the treating of, or who shall treat or profess to treat, or advertise as treating, any diseases or disorder or lesions of the oral cavity, teeth, gums, maxillary bones, or extract teeth, or repair or fill cavities, who shall correct malpositions of the teeth or jaws, or supply artificial teeth as substitutes for natural teeth, or administer an anesthetic, general or local, or in any other way engage in the practice included in the curricula of recognized dental colleges; *provided, however*, that nothing in this section shall conflict with the meaning of Section 18 of this act.

SEC. 25. *Repealing former laws.* All laws and parts of laws in conflict with this act are hereby repealed.

SEC. 26. *Time of effect of act.* This act shall take effect immediately after its passage, the public welfare requiring it.

Effective February 17, 1915.

DENTAL COLLEGE COMMENCEMENTS.

UNIVERSITY OF PITTSBURGH, SCHOOL OF DENTISTRY.

AT the annual commencement exercises of the University of Pittsburgh, School of Dentistry, the degree of Doctor of Dental Surgery was conferred on the following graduates:

George P. Anderson	Pennsylvania
Frank A. Banks	Pennsylvania
Joseph F. Barrett	New York
Earl F. B. Campbell	Pennsylvania
Earl Conlin	Pennsylvania
William A. Dunn	West Virginia
Malden J. Fast	Pennsylvania
Robert B. Fisher	Pennsylvania
Hyman A. Frank	Pennsylvania
James H. Frew	Pennsylvania
Thomas R. Galvin	West Virginia
Gorman E. Getty	Pennsylvania
Alfred L. Gregory	Ohio
Norman S. Griffith	Pennsylvania
Robert L. Griffith	Pennsylvania
James W. Hammond	Pennsylvania
Bernard L. Herron	Pennsylvania
Edward C. Hilger	Pennsylvania
John T. Keiser	Pennsylvania
Roy H. Kernohan	Pennsylvania
Russell H. Kirk	Pennsylvania
Hanna Kloetzer	Bohemia
Frank R. Leighner	Pennsylvania
Carter H. Lewis	Pennsylvania
Samuel Lichter	Pennsylvania
Walter D. Love	Pennsylvania
Thomas B. Magee	Pennsylvania
Emanuel G. Meisel	Pennsylvania
Harry C. Metz	Pennsylvania
William H. McKinley	Pennsylvania
Albert B. Newell	Pennsylvania
Louis H. Nicholls	West Indies
Plummer O. Nixon	Pennsylvania
Charles E. Overberger	Pennsylvania
Loraine L. Painter	West Virginia
Glenn W. Peiffer	Pennsylvania
Lester L. Preiss	West Virginia
Charles S. Reese	Pennsylvania
Raymond J. Robison	Pennsylvania
Arnaud Rosenthal	France
Homer M. Russell	New York
Harvey LaM. Sanderson	Pennsylvania
Horace C. Scott	Pennsylvania
Claude A. Schumaker	Pennsylvania
Leo Shonfield	Pennsylvania
Wayne B. Smith	Pennsylvania
Lisle Speedy	Pennsylvania
Howard D. Taylor	Pennsylvania
Oren W. Wallace	Pennsylvania
Frederic F. Ward	Pennsylvania
George W. Weiland	Pennsylvania
Gustav R. Weinmann	Pennsylvania
William W. Weiss	Pennsylvania
Karl F. Weller	Pennsylvania
Alfred C. Young	Pennsylvania

NORTH PACIFIC COLLEGE.

THE annual commencement exercises of North Pacific College were held in Portland, Ore., on May 19, 1915.

Addresses were delivered by Wm. T. Foster, Ph.D., and E. L. Thompson.

The degree of Doctor of Dental Medicine was conferred by Dr. H. C. Miller, president, on the following graduates:

Chester M. Allen	George F. Freeburger	Earl J. McClung	Alfred F. Sempert
Thomas J. Anders, Jr.	Harlow L. Gibbon	Stuart McGuire	Emma E. Shaughnessy
Ray Appleby	Wm. B. McD. Gordon	Reginald E. McKeon	Harley R. Smith
Thomas R. Baldwin	Adolph C. Grabbert	Grover T. McLaughlin	Lorenzo F. Snyder
Robert E. Blakemore	Dallas E. Hardenbrook	Thomas G. McMartin	Mary Stephenson
Charles H. Bleeg	Walter W. Hart	James A. McMillan	Samuel H. Sussman
Elmer E. Blix	Edward Hartford	Frank E. McNett	Walter R. Swart
Maurice J. Butler	Asta Lucy Hauge	Fred L. Mellor	Francis C. Tierney
Ray R. Butler	Charles D. Hester	Ralph I. Mills	Galen A. Truesdell
John C. Campbell	Wallace Hylander	Chester E. Nelson	H. H. Van Eaton
Lewis Christopherson	Harry E. Johnson	John E. Newman	Henry A. Wagner
Charles C. Cleek	Verne L. Johnson	Olaf A. Olson	Charles J. Webster
Ray F. Cole	Francis C. Jones	Wallace H. Pasley	Richmond Wells
Charles E. Corbett	Harry J. Kelly	Charles T. Prehn, Jr.	Elvera F. Westberg
George E. Dale	Ernest M. Kenyon	Charles A. Rae	Victor M. Westberg
Marion R. Deiter	Claude M. Lovelace	Robert B. Robbins	Gordon L. Whitcomb
Chester C. Edgar	Wynn G. Manning	Avery R. Roberts	Clyde B. Wilde
Bert R. Elliott	Grant McClellan	Edward C. Roberts	Fred L. Winder

ST. LOUIS UNIVERSITY, DEPARTMENT OF DENTISTRY.

THE annual commencement exercises of St. Louis University, Department of Dentistry, were held Thursday, June 17, 1915, in St. Louis, Mo.

Addresses were delivered by Rev. Wm. F. Robison, S. J., and Rev. Bernard J. Otting, S. J., president of the university.

The degree of Doctor of Dental Surgery was conferred on the following:

John D. Albin	Missouri	Henry E. Lartonoix	Missouri
Van Andrew	Illinois	Collins A. LeMaster	Missouri
Milford A. Axline	Missouri	Curtis W. McGee	Missouri
Pearly H. Bayles	Missouri	Ernest M. McGrath	Missouri
Benjamin B. Blass	Missouri	George A. Meine	Missouri
Charles E. Berg	Illinois	William A. Montgomery	Missouri
Demeter Bouyoucoglou	Greece	Edwin B. Moore	Missouri
Forest G. Carlstead	Missouri	Hugh G. Moran	Missouri
John W. Coulter	Arkansas	Dibrell H. Morden	Arkansas
Bolin Criner	Arkansas	Doyle B. Morris	Illinois
Monroe Dixon	Illinois	Thomas E. Mosley	Missouri
Henry L. Dodd	Illinois	Courtney J. Murphy	Missouri
Llewellyn Douglas	British Columbia	Russell S. Norris	Illinois
William C. Drummond	Illinois	August W. Richter	Missouri
Charles H. Edwin Dunn	Utah	Melvin D. Ribgy	Illinois
George S. Evans	Missouri	Louis E. Robbins	Arkansas
Frederick W. Fender	Illinois	Charles S. Rovitsky	Missouri
Lloyd Foster	Missouri	Enslie I. Schilb	Missouri
Otto F. Freitag	Missouri	John A. Schmitt	Missouri
Ben A. Fuld	Missouri	Frank P. Schuck	Iowa
Edward Gilbert	Illinois	Clyde A. Self	Arkansas
Porter E. Gray	Missouri	Jesse E. Severns	Illinois
Frank Greer	Illinois	Walter S. Severns	Illinois
William H. Gregory	New Mexico	Grover C. Smith	Missouri
Harry Hamburg	Missouri	Robert W. Smith	Illinois
Booker N. Hargis	Arkansas	William G. Tonkinson	Illinois
Felix Herschman	Missouri	Esco J. Towell	Missouri
John L. Huchel	Illinois	Robert S. Tully	Missouri
Aurel A. Hucker	Missouri	Benjamin Vogel	Missouri
Orren R. Keenan	Illinois	William E. Wagner	Illinois
William J. Keough	Kansas	Julius Walter	Missouri
Waldomar Krueger	Illinois	Henry L. Yancey	Arkansas

UNIVERSITY OF TENNESSEE, COLLEGE OF DENTISTRY.

At the annual commencement exercises of the University of Tennessee, College of Dentistry, held in Memphis, Tenn., the degree of Doctor of Dental Surgery was conferred on the following graduates:

Archie J. Bigger, Jr. ..... Alabama	Munsey W. Gosnell ..... Arkansas
James F. Bigger ..... Alabama	Adin W. Hudson ..... Tennessee
Lawrence P. Busby, Jr. ..... Tennessee	Thomas J. Meador ..... Tennessee
Southall Dickson, Jr. ..... Tennessee	Henry S. Neel ..... Arkansas
Virgil M. Fields ..... Tennessee	William E. Woodard ..... Louisiana
William W. Gill ..... Arkansas	

LAVAL UNIVERSITY, SCHOOL OF DENTAL SURGERY.

The annual commencement exercises of Laval University, School of Dental Surgery, were held in June 1915, in Montreal, Can.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Gilles Amiot	O. E. Desroches	Pancrace Fleury	Elie Jobin	A. Melady
Eugène Beaulieu	Lucien Dufresne	Arthur Fournier	Lomer Lafond	Louis Sauvé
Stanislas Bertrand	Martial Durand	Frédéric Houde	A. L'Archevèque	Georges Séguin
J. O. E. Brunet	Eugène Farrell	Adjutor Jinchereau	Edouard Latour	

The degree of Bachelor of Dental Surgery was conferred on the following graduates:

Emile Beaulieu	T. Côté	Arthias Heynemand	A. Marcoux	W. Monette
Armand Cardinal	Denis Forest	G. Leblanc	A. Massicotte	E. Plourde
I. Chalifoux				

UNIVERSITY OF MICHIGAN, COLLEGE OF DENTAL SURGERY.

The annual commencement exercises of the University of Michigan, College of Dental Surgery, were held June 24, 1915, in Ann Arbor, Mich.

The commencement address was delivered by Wm. O. Thompson, LL.D., president of Ohio State University.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Albertus H. Ackerman	Robert L. Donaldson	John A. Kimmel	Herbert F. Pedler
Lawrence E. Aldrich	Marion L. Drake	Andrew Kühn	John H. Penhale
Simon Alperin	Seymour LeG. Elliott	Forrest H. Kurtz	Harold E. Rice
Harold A. Badger	Ralph F. Enstine	Burr W. Lathrop	Bertsel D. Roe
Wilber E. Bailey	Reginald L. Felton	Lyle C. Ling	Harold D. Rose
Garnet D. Beierl	Bernard B. Foster	Roger S. Loring	Clarence W. Schroeder
Lloyd B. Bond	Edward C. Freeland	Stanley C. Lucas	Lawrence A. Sherry
Arnold Bosscher	William I. French	Wesley McConalogue	John C. Shoemaker
Charles P. Bower	John N. Gallagher	Frank W. McDonald	Harold A. Silverstein
George J. Broodman	Veder D. Gardner	James MacK. MacVicar	Einar W. Sivula
Carroll S. Brown	LeRoy F. Garrison	Harold R. Mead	Walter A. Slavinski
Robert Brown	Warren P. Gibson	William C. Melvin	Roy E. Smith
Carlton F. Cantor	Clinton S. Hafford	William W. Mitchell	William E. Smith
Willem H. Cilliers	Vern S. Harshman	Clarence M. Mote	Harry C. Striffler
Howard I. Clark	Robert E. Haskett	Clarence H. Moyer	Gerald D. Strong
Walter C. Collins	Harold D. Henderson	Cecil R. Mull	Frederick R. C. Thorold
Claude L. Cross	William H. Hubbard	Raymond E. Nichols	Elliel A. Waara
William W. Davis	Arthur C. James	Ardashes J. Nishon	William H. Waller
Marion C. Dekker	Neil F. Jones	Leo J. O'Brien	Ralph McK. Waltz
Howard R. Dingler	Alfred W. Kany	Earl C. Peabody	Leo J. Witmire

Society Notes and Announcements.

NORTHEASTERN DENTAL ASSOCIATION.

The Northeastern Dental Association will hold their twenty-first annual meeting in Springfield, Mass., on October 13, 14, and 15, 1915.

Alvin A. Hunt, *Sec'y*,
Hartford, Conn.

LOUISIANA STATE DENTAL SOCIETY.

At the thirty-seventh annual meeting of the Louisiana State Dental Society, held in New Orleans for the first time in seven years, the following members were elected to serve during the 1915–16 term: Dr. J. Hall Le Blanc, president; Leo C. Dempsey, first vice-president; H. H. Hawsey, second vice-president; J. Crimen Zeidler, recording secretary; Robert L. Carter, corresponding secretary; O. J. Ory, treasurer.

Lake Charles, La., was selected as the meeting-place of the society for 1916.

J. Crimen Zeidler, *Sec'y*,
New Orleans, La.

VERMONT STATE DENTAL SOCIETY.

The Vermont State Dental Society held a very successful meeting in Burlington, May 19 and 20, 1915, at which the following were elected officers of the society: W. H. McGoff, president, Montpelier; H. M. Smith, first vice-president, Lyndonville; G. E. Partridge, second vice-president, Burlington; P. E. Mellen, secretary, Middlebury; W. H. Munsill, treasurer, Wells River. Executive Committee—W. R. Pond, Rutland; David Manson, Burlington, and P. M. Williams, Rutland.

P. E. Mellen, *Sec'y*.

MICHIGAN BOARD OF EXAMINERS.

The next regular meeting of the Michigan State Board of Dental Examiners, for the examination of applicants who wish to practice dentistry in Michigan, will be held at the dental college at Ann Arbor, beginning Monday, November 1, 1915, at 8 A.M., and continuing through Saturday, November 6th.

For application blanks and full information apply to

A. W. Haidle, *Sec'y*,
Negaunee, Mich.

EXAMINATION OF DENTISTS FOR THE U. S. ARMY.

The Surgeon-general of the army announces that examinations for the appointment of acting dental surgeons will be held at Fort Slocum, N. Y.; Columbus Barracks, Ohio; Jefferson Barracks, Mo.; Fort Logan, Colo.; and Fort McDowell, Cal., on Monday, October 18, 1915.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S. Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and twenty-seven years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Acting dental surgeons are employed under a three years' contract, at the rate of $150 per month. They are entitled to traveling allowances in obeying their first orders, in changing stations, and in returning to their homes at termination of service. They also have the privilege of purchasing certain supplies at the army commissary. After three years' service, if found qualified, they are promoted to the grade of dental surgeon, with the rank of first lieutenant, and receive thereafter the pay and allowances appertaining to that rank.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination. Early attention is therefore enjoined upon all intending applicants. There will be twelve vacancies to be filled.

ARMY DENTAL SURGEONS.

Memoranda of Changes.

For the week ending Saturday, June 12th:

Acting Dental Surgeon Frank C. Cady is relieved from his present duty, and will proceed without delay to his home, and upon arrival there will report by telegraph to the Surgeon-general of the army for annulment of contract.

Leave of absence for three months and two days is granted Acting Dental Surgeon Frank C. Cady, to take effect upon his arrival at his home.

Acting Dental Surgeon Charles B. Seely, Jr., is relieved from his present duty, and will proceed without delay to his home, and upon arrival there will report by telegraph to the Surgeon-general for annulment of contract.

Leave of absence for three months is granted Acting Dental Surgeon Charles B. Seely, Jr., to take effect upon his arrival at his home.

Acting Dental Surgeon Donald W. Forbes, recently appointed, will report in person to the commanding officer of the Letterman General Hospital, the Presidio of San Francisco, for temporary duty.

First Lieutenant James F. Feely is relieved from duty in the Philippine Department, to take effect on or about September 15, 1915, and will then proceed to the United States, and upon arrival report for further orders.

The following-named acting dental surgeons are relieved from duty in the Philippine Dep't, to take effect on or about September 15th, and will then proceed to the United States, and upon arrival report for further orders in accordance with General Orders No. 80, Oct. 26, 1914, War Dep't: John W. Scovel, William A. Squires, Mortimer Sanderson, Benjamin C. Warfield, and Lester C. Ogg.

Each of the following-named acting dental surgeons is relieved from duty at the post specified after his name, to take effect at such time as will enable him to comply with this order, and will proceed at the proper time to San Francisco, Cal., and take the transport to sail from that place on or about September 5th, for the Philippine Islands, and report in person to the commanding general for assignment to duty: Don G. Moore, Fort Totten, N. Y.; Samuel J. Randall, Fort Robinson, Nebr.; Charles Tainter, Fort Barrancas, Fla.; Harlan L. Thompson, Fort Sill, Okla.; Robert B. Tobias, Douglas, Ariz.; Harry C. Peavery, Fort Williams, Me.; Eugene Milburn, Columbus Barracks, Ohio; Claudius G. Baker, Fort Adams, R. I.

For the week ending Saturday, June 19th:

Acting Dental Surgeon Oscar G. Skelton is granted leave of absence for one month and fifteen days, to take effect on or about June 10th.

For the week ending Saturday, June 26th:

Acting Dental Surgeon Wm. A. Squires is relieved from duty in the Philippine Department, to take effect on or about January 15th, and directed to proceed to the United States, and upon arrival report for further orders in accordance with General Orders No. 80, October 26, 1914, War department.

Acting Dental Surgeon James L. P. Irwin, recently appointed, will report in person to the commanding officer, Vancouver Barracks, Wash., for temporary duty and by letter to the commanding general, West Department.

Acting Dental Surgeon Don G. Moore, Medical Corps, is granted leave of absence for one month, effective about July 25th, and terminating not later than September 5th.

Itineraries: The posts of the following-named surgeons will be:

Acting Dental Surgeon John R. Ames, Medical Corps, Fort Moultrie, S. C., July 1st to August 19th; Fort Screven, Ga., August 20th to November 8th; Fort Caswell, N. C., November 9th to December 31st.

Acting Dental Surgeon Geo. D. Graham, Medical Corps, Plattsburg Barracks, N. Y., July 1st to September 30th; Fort Ethan Allen, Vt., October 1st to December 31st.

Acting Dental Surgeon J. Craig King, Medical Corps, Fort Myer, Va., July 1st to October 11th; Washington Barracks, D. C., October 12th to December 31st.

Acting Dental Surgeon E. Repp Dale, Medical Corps, Fort DuPont, Del., July 1st to July 29th; Fort Hancock, N. J., July 30th to November 3d; Fort Washington, Md., November 4th to November 17th; Fort Hunt, Va., November 18th to December 1st; Fort Howard, Md., December 2d to December 31st.

For the week ending Saturday, July 3d:

Acting Dental Surgeon John H. Hess is directed to proceed from Fort Egbert to Fairbanks, and then to Fort Gibbon, Alaska.

Leave of absence for three months, to take effect on or about July 15th, is granted First Lieut. Julien R. Bernheim.

For the week ending Saturday, July 10th:

Acting Dental Surgeon Donald W. Forbes is relieved from temporary duty at the Letterman General Hospital, the Presidio of San Francisco, Cal., and will proceed to Madison Barracks, New York, and report in person to the commanding officer of that post for duty and by letter to the commanding general, Eastern Department.

For the week ending Saturday, July 17th:

Acting Dental Surgeon John R. Ames is granted leave of absence for one month, effective about August 1st.

Acting Dental Surgeon R. F. Patterson will proceed on July 2d to Fort Meade, S. D.

Acting Dental Surgeon J. L. P. Irwin will proceed about July 15th to Fort Columbia, Washington, for ten days, and return to San Francisco, Cal.

For the week ending Saturday, July 24th:

Acting Dental Surgeon R. Miller, Med. Corps, is ordered from Fort Bliss, Texas, to Fort Bayard, New Mexico, for a period of two months.

Acting Dental Surgeon R. W. Pearson, Med. Corps, is ordered from Fort McIntosh to Eagle Pass, Texas, for temporary duty.

Acting Dental Surgeon R. B. Tobias, Med. Corps, is granted leave of absence for two months; effective about July 5th.

Acting Dental Surgeon J. L. P. Irwin, Med. Corps, will proceed from Vancouver Barracks, Wash., about July 15th, to Fort Columbia, Wash., for a period of ten days.

Acting Dental Surgeon C. E. Lauderdale, Med. Corps, is granted leave of absence for one month and twenty days, effective about July 20th.

For the week ending Saturday, July 31st:

Acting Dental Surgeon J. L. P. Irwin, will proceed from Fort Columbia, Wash., to Fort Stevens, Ore.

First Lieutenant S. Davis Boak is relieved from duty at West Point, N. Y., as soon as his services can be spared after the arrival of Lieutenant Alister. and upon the expiration of the leave of absence heretofore granted him will proceed to Columbus Barracks, Ohio, and report to the commanding officer of that post for duty, relieving First Lieutenant George R. Gunckel.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING JULY 1915.

July 6.

No. 1,145,368, to EDMUND J. HUFF, JR., and FREDERICK A. JOHNSTON. Crown-post.

No. 1,145,433, to WILLIAM E. PAPPERT. Flask.

July 13.

No. 1,146,264, to WILL S. KELLY. Dental splint.

No. 1,146,550, to JOHN BURNS. Dental molding apparatus.

No. 1,146,556, to ARTHUR W. DAVIS. Artificial tooth.

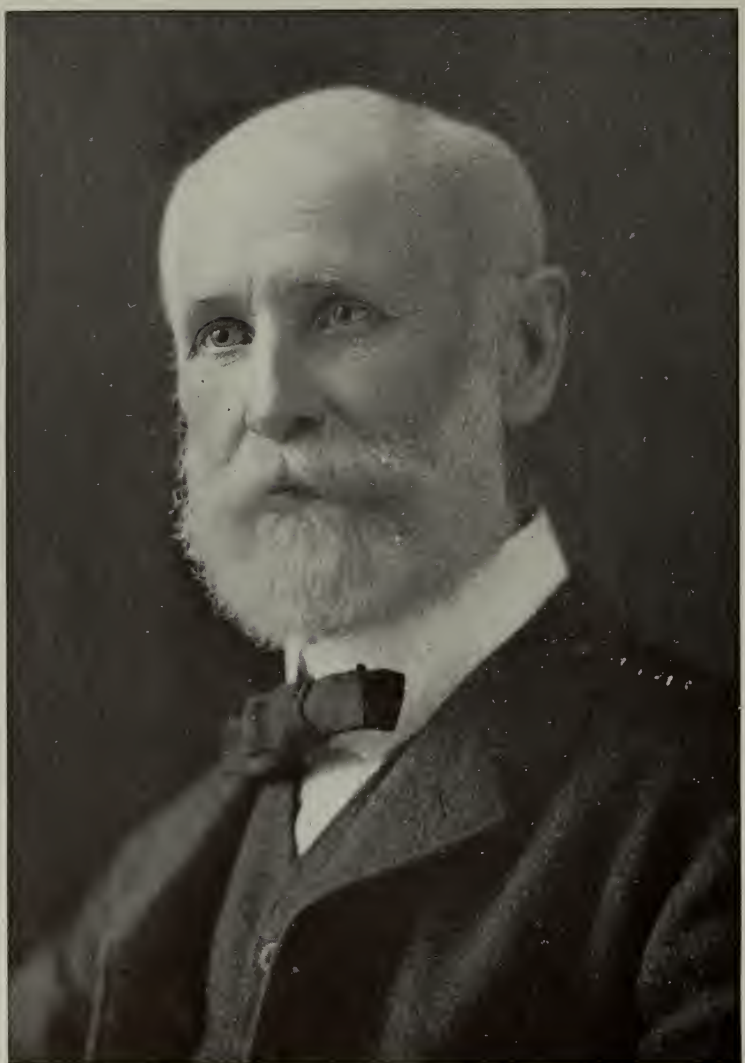
July 20.

No. 1,147,341, to MITRIDATES H. PLATA. Saliva-ejector.

No. 1,147,580, to JOSEPH F. TURNER. Dental fulcrum-forceps.

No. 1,147,594, to CALVIN C. BALL. Dental tool.

No. 1,147,597, to JOHN K. BISHOP. Method of replacing broken dental facings.



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ORIGINAL COMMUNICATIONS.

ON CYSTIC TUMORS OF THE MAXILLÆ, AND ESPECIALLY ON ADAMANTINE CYSTADENOMAS (ADAMANTOMAS).

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Root-cysts.

CYSTS of the maxillæ are quite often encountered, especially if the comparatively frequent root-cysts of the alveoli of the teeth are taken into consideration. They are as a rule round or oblong, of varying size from a pinhead to a hazelnut. Some are solid; some, particularly the larger ones, are cystic, and contain as a rule a serous fluid, which, however, under more acute inflammatory conditions, may be purulent.

The larger cysts have a tendency to expand the walls of the jaw and develop into regular maxillary cysts. They constitute the sequelæ of a chronic suppurative inflammation—a periosteitis, or more correctly, a pericementitis—and are produced by degenerative changes of granulation tissue. Interesting is the fact that these cysts, frequently connected with the root of a tooth, are often lined with epithelium. This is, however, supposed to be due to the fact that the epithelium, which normally covers the tooth for a considerable depth, has taken an active part in the local inflammatory process, and has proliferated and gradually covered the small depression formed within the granulation tissue. This subject has been treated in a paper by Johan Rygge, M.D., D.D.S., read before the Christiania Medical Society.* These cysts, however, are quite familiar, and are not to be discussed in this paper, but there are other cyst formations, especially cystic tumors, which are most interesting, their genesis being so clear, at least theoretically.

Follicular Cysts.

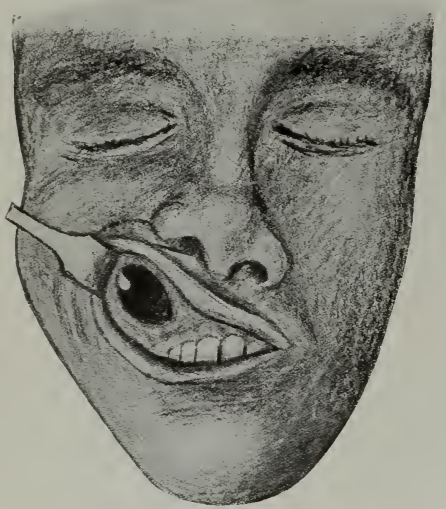
We shall first discuss the so-called follicular cysts. These are located in the maxillæ, preferably the upper jaw. They grow slowly, but may ultimately

* "On Maxillary Cysts." *Norsk Magazin for Lægevidenskaben*, 1903, No. 8.

attain the size of a hen's egg and even larger, and may cause atrophy of large parts of the jaws. They develop as a rule at the age of from twelve to sixteen years; contain a thin, mucoid fluid, and are internally lined with epithelium. Their characteristic content is a rudimentary or fully developed tooth, whose crown is directed inward. At times there may also be observed numerous small embryonic dental organs or teeth.

In Norwegian medical literature a typical case of follicular cyst has been

Fig. 1.



described by Dr. Wettersbad,* assistant physician to the ear, nose, and throat department of the State Hospital.

This occurred in a boy of eighteen, in whose right cheek a swelling had developed during the previous six months, without, however, causing any pain. At the operation there was found in the right canine fossa a hemispherical expansion of the bone, including the lateral wall of the alveolar process. In the otherwise hard bony wall crepitation was observed in places. The cyst, which had reached the size of a small apple, was opened. (See Fig. 1.) It occupied a large part of the antrum of Highmore, and contained a purulent fluid and a tooth with its crown directed inward. The cyst was irrigated, tamponed, and contracted gradually.

A similar case came under my personal observation, as follows:

CASE I.

This case was brought to my attention in October 1911 by Dr. S. Bang of Trondhjem, who sent me an extirpated maxillary cyst removed from a woman of sixty-three years. At the operation resection of the maxilla also was performed, and the submaxillary gland and two lymph glands were removed. The tumor was situated on the right side of the mandible. It was 5 by $\frac{3}{4}$ cm. in diameter. The skin over the tumor was freely movable; it bulged mostly outward. The patient was edentulous. The cyst-wall was very thin, and during its removal broke in several places. The lower aspect of the mandible was intact. The patient had first observed the growth two or three years previously. The last year it grew rapidly, although there was no pain. The neoplasm was a large, thin-walled osseous cyst containing a thick, brownish, chocolate-colored fluid. The osseous capsule surrounding the cyst was so thin and pliable that it could easily be bent; —one wall was even perforated. The cysts were internally covered by a yellowish-brown, dirty-looking membrane. The glands were typically tubercular.

Microscopic examination. On microscopic examination a section of the cyst membrane shows a quite heavy fibrous membrane covered internally by a flat, not well defined, squamous stratified epithelium. The membrane is in many places infiltrated with cells and contains blood pigment and detritus; also in places crystals of fatty acids surrounded by granulation tissue with numerous giant cells. The connective tissue has partially undergone hyaline degenera-

* "A Case of Follicular Dental Cysts, with Comments on Maxillary Cysts in General." *Den Norske Tandlægeforenings Tidende*, xxii, December 19, 1913, p. 173.

tion and calcarious infiltration. In a somewhat thicker part of the cyst wall is situated a long, branching, epithelial string quite sharply defined, and made up of small typical squamous epithelial cells. It sends its tendrils toward the squamous epithelium which covers the cyst internally, and also toward larger epithelial masses, which in heavy layers cover a smaller cystic formation. A diagnosis was rendered of epithelial cyst of the jaw; follicular cyst.

Summary. Considering the location, size, and the complete epithelial covering, there can hardly be any doubt that we have to deal with a cyst formation from an embryonic starting-point, a tooth-organ—namely, remnants of the epithelium (common enamel germ) which have become isolated in the jaw and later have undergone growth and developed into an epithelium-lined cyst. A genuine special enamel germ has not been present, as is proved by the fact that no tooth or crown of a tooth was found on the inside of the cyst wall. Of special interest as to the genesis of this growth are the epithelial strings distributed in the cyst walls. This can hardly be explained in any other way than that some portion of the epithelium which forms the "common enamel" germ has been cut off and has later developed into an epithelium-lined cyst, but without teeth or parts thereof.

These cysts are not genuine tumors; the cell proliferation is not progressive, but their growth is dependent on retention of cyst secretions, possibly combined with multiplication of the lining epithelium.

Polycystic Adamantoma.

A geniune tumor formation is the so-called *adamantoma* polycysticum*, or *cystadenoma adamantinum*. These tumors are exceedingly slow-growing neoplasms situated intramurally in the jaws, almost invariably the lower. They are made up of more solid tumor masses and of smooth-walled, mostly round cysts separated by thin partitions. The transition between the solid and cystic forms may as a rule be recognized by the fact that even in the more solid parts small drops of mucus, or jelly-like softened areas are seen marking the first step in the cyst formation, which is brought about by mucoid degeneration of the central portions of large epithelial masses which constitute these growths.

Their structure is very peculiar. They are made up of a stroma rich in cells in which are imbedded large, branching, epithelial strings ending peripherally in a row of tall columnar cells arranged in palisade fashion. Inside of this layer are seen smaller polymorphous, often long, spindle-shaped, sometimes star-shaped cells placed in the central part of the cell mass in a mucoid ground-substance, or cystic degeneration may have taken place. The structure resembles in a striking manner the enamel organ of the teeth at the stage when the epithelium, after having dipped down from the epithelial covering of the mouth, subdivides into smaller heaps which again arrange themselves into a dome-shaped organ, the cells of which successively are converted into enamel prisms. This epithelium, as is well known, arranges itself into different layers, namely: Innermost or lowermost (that is, toward the tooth papilla), tall columnar cells —adamantoblasts—which furnish the enamel (substantia adamantina); outermost or uppermost, a more flattened, cubical layer which continues far down on the sides of the papillæ; and between these a cell mass the individual members of which, by transformation into star-shaped cells and by secretion of a mucoid intercellular substance, form a mucous tissue—the enamel pulp. It is here that the starting-point of the adamantoma must be sought. This tumor must, according to its structure, arise from the enamel organ, at its undeveloped, embryonic stage; either from remnants left over after it has provided material for development of the individual teeth (*débris paradentaires epithéliaux* of Malassez), or from a supernumerary enamel germ, with its subsequent

* Adamantoma is a more correct name than "adamantinoma."

enamel organ, or from remnants of the common enamel germ. Their evident origin adds to the interest attached to these growths.

Clinically, they should be classified with the benign (typical homogenous) neoplasms; the cystic forms with the cystic adenomas. Although, on account of their progressive growth and great size, they may become serious, they are not malignant. Their growth is slow, continuing through years, sometimes decades. If the entire tumor tissue is not removed, the growth may recur, but it does not metastatize—at least there are no authentic reports to that effect on record. As to age, these neoplasms occur as a rule at the age of from thirty to fifty years, but also at from sixty to seventy years. They have been found in children, even in a baby six months of age. The cystadenoma, the most frequent form—up to the present time from thirty-five to forty cases have been reported—grows very slowly, but attains great size, even that of a child's head, as in a case described by Bryck. The cysts have in a few instances contained teeth; this is, however, exceptional.*

As illustrative examples of such growths I shall relate the following cases:

CASE II.

In December 1912, Dr. Huitfeldt sent me a large cystic tumor removed from the mandible of a man of fifty-five years. Dr. Huitfeldt had previously in our medical society reported on the clinical history of this case; on the operation and the results of the after-treatment with radium:† The patient, a master me-

FIG. 2.

FIG. 3.

* Similar tumors have also been found in the jaws of animals—see paper by A. F. Fölger, "On Adamantinoma in Domestic Animals—Three Cases Starting from the Lower Jaw of the Ox." *Danish Monthly Magazine for Veterinaries*, vol. xxiv, 1912.

† Discussion in Proceedings Medical Society of Christiania, 1913, pp. 56 ff.

chanic of fifty-five years, in 1887 was operated on by Dr. Malthe for a tumor of the lower jaw ascribed to treatment of the patient's teeth about six months previously. After removal, the tumor soon reappeared and steadily enlarged. (See Fig. 2.) In 1896, an incision was made in the then apple-sized growth, and some pus was removed, whereupon it decreased in size, but soon again enlarged, causing, from 1896 on, severe neuralgic pains. The neoplasm was considered

Fig. 4.

After operation.

inoperable, and roentgen-ray treatment was resorted to. As a result the pain decreased, while the tumor remained unchanged; subsequently it again increased in size and the pain became worse. (See Fig. 3.) In the summer of 1912 the tumor spontaneously opened both facially and orally. On account of a steady trickling of a viscid fluid into the throat and of the large size of the tumor, respiratory difficulties ensued. The teeth of the left side of the mandible dropped out. On examination, on December 3, 1912, Dr. Huitfeldt found a cocoanut-sized tumor in the left side of the face in the region of the cheek, reaching from the lower rim of the orbit to below the angle of the jaw, and from the eye to the left angle of the mouth. The integument over the tumor was freely movable. From a small fistulous opening oozed a sero-sanguinous secretion. The consistence of the tumor was firm, possibly fluctuating; it also bulged into the cavity of the mouth covered by an intact mucous membrane, which only in one small spot was ulcerating. The entire horizontal portion of the mandible was included in the tumor. No metastasis could be demonstrated. Partial resection of the tumor followed by radium treatment was decided on. The operation was performed on December 5, 1912. The neoplasm was found to be covered with a smooth membrane. It had crowded the body of the mandible upward, and converted it into a grayish tumor-like mass with large cystic spaces filled with a chocolate-colored fluid. As much as possible of the tumor tissue—without opening into the cavity of the mouth—was removed, but a considerable amount remained. Subsequently, radium treatment was applied, partly through the wound and partly from the cavity of the mouth. (See Fig. 4.) The applications were of from twenty-four to forty-eight hours' duration, consisting of up to 10 ctg. radium bromid per treatment, at six-weeks intermissions. The tumor responded to this treatment; it decreased until, in March 1913, it was reduced to the size of a walnut. New development of bone was also brought about. The patient's general health improved, and he has lately, according to Dr. Huitfeldt's reports, felt very well. There is still left in the scar after the incision a pigeon-egg-sized infiltration, supposedly remnants of the tumor; the possibility of a recurrence can therefore not be excluded.

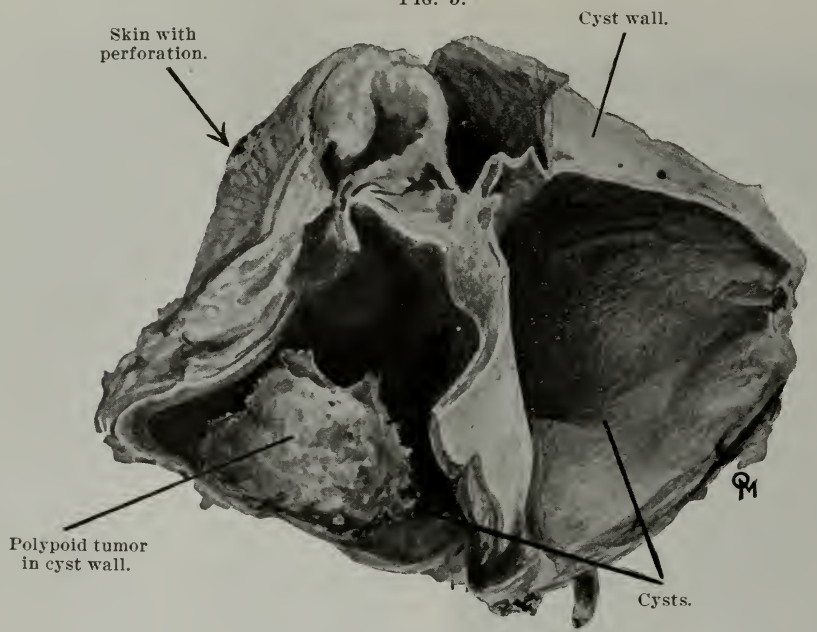
The extirpated tumor-like masses were, on the day of the operation, forwarded to the Pathological Institute. They were as large as a fist, and con-

sisted principally of two egg-sized cysts with comparatively smooth walls. Into the cavity of one of the cysts projected a walnut-sized, soft papillomatous mass, and the walls of this cyst were uneven and thickened, measuring up to 2 cm. The tumor-like tissue was grayish white, partly soft and spongy. Necrotic areas with formation of small cysts, appearing as yellowish spots, were observed. The cut surface also showed in places

also presented a diffuse infiltration of the surrounding tissue.

Microscopic examination. Microscopic examination revealed, in specimens taken from the solid walls as well as from the large papillomatous excrescence found on the internal surface of one of the cysts, the same main characteristics: In a fibrous, comparatively poorly cellular stroma are seen masses of branching, winding, well-defined epithelial strands

Fig. 5.



small papillary elevations. On cutting through the papillomatous mass a grayish-white, spongy, tumor-like tissue was seen, in which numerous small cysts and smaller viscid and jelly-like spots were observed. (See Fig. 5.) In the extirpated parts of the cheek, with remnants of the jaw, small accumulations of shell-like bones irregularly distributed were found here and there. Corresponding to the fistulous opening are seen soft, jelly-like tumor-like masses extending upward to the surface. Near the tumor were found some swollen, yellowish-brown lymph glands. Although the neoplasm formed a more isolated mass, it

of the most divergent patterns. In a section from the small epithelial alveoli is found a homogeneous structure, in the periphery (see Fig. 6) more columnar cells arranged perpendicularly to the surface, with transition into and inclosing smaller polygonal epithelium with poorly defined outlines and partly containing oblong nuclei resembling connective tissue cells. In the center of the larger alveoli are observed retrogressive changes, consisting of inflation of the cells with consequent formation of vacuoles, simultaneous with a change in the appearance of the cells, which resemble more closely connective tissue,

spindle- and even star-shaped. A progressive enlargement and vacuolation of with mucoid contents are formed. The structure of the walls and of the papil-

FIG. 6.

Adamantoma. (Zeiss obj. A, oc. 2.)

FIG. 7.

Adamantoma. (Zeiss obj. DD, oc. 2.)

the cells goes on until they form cystic spaces separated by threadlike structures, and finally larger centrally located cysts lomatous masses is, as before mentioned, the same. The cell masses are well bounded, but the growth must be char-

acterized as infiltrating. (See Fig. 7.) The larger cysts contain a sero-mucoid fluid, and the epithelial lining is here to a great extent so atypical and degenerated that the epithelial nature of the growth is difficult to recognize. In the swollen lymph glands which surrounded the tumor no epithelial masses were found indicative of metastasis.

Conclusions. This case presents many interesting features: (1) Slow development—the patient had observed the tumor for twenty-five years; (2) the growth, besides presenting all the characteristics of a multilocular cystadenoma, also contained in its walls solid tumor-like masses, and finally, on the inside wall of a larger cyst, a papillomatous neoplasm. The development from the solid into the cystic regions of the tumor could therefore be clearly demonstrated. Further, this case could not, from an anatomical viewpoint, be considered malignant, although destruction of bone had occurred in a great measure (necrosis caused by pressure), and although the tumor, on account of its size and its opening inward, caused the greatest inconvenience. It was also considered as an inoperable malignant growth, most likely a carcinoma.

CASE III.

Another case of adamantoma was briefly reported by assistant physician Dr. Med. S. Widnöe in the meeting of the Christiania Medical Society, March 10th, and again mentioned in the meeting of December 2, 1914.

A tumor in the left lower jaw had developed for the last two months in a girl of fourteen years. It was removed by Dr. S. Widnöe on July 26, 1913, under local anesthesia. The tumor was cystic and had mucoid contents. Dr. Widnöe later reported on the same case and particularly described the osteoplastic operations he performed in order to cover the defect of the jaw. First a piece of the fibula was transplanted and fastened by aluminum-bronze sutures. Suppuration, however, set in, and the transplanted material had to be removed. Dr. O. S. Glad then applied wire clasps, and subsequently a new osteoplastic operation was performed on October 23, 1913. Under local anesthesia a 5 cm.-long piece of the twelfth rib was resected and placed in the defect under aseptic precautions. No reaction occurred, but as complete union did not take place; a new operation had to be performed in May 1914, and a piece of the ramus of the jaw, including the periosteum, was placed in the defect, after removal of the medial piece. Union without deviation was obtained. Later a rubber plate was applied. The tumor was examined microscopically by Prosector Hansteen,

Fig. 8.

Cystic adamantoma.

who rendered the diagnosis of adamantoma. The case was later placed at my disposal.

The excised piece of the left half of the mandible is about 4 cm. long, and includes the space between the canine and the second incisor inward and between the first and second molar outward. In the anterior part of this piece of bone is situated a walnut-sized cystic tumor which, on the outer aspect of the jaw, forms a hemispherical enlargement protruding about 1 cm. This enlargement is covered by connective tissue and a thin cyst-capsule, which may easily be compressed and then faintly crepitates. It contains small remnants of bone. On the inner side of the jaw also the bone has become atrophied and bulges somewhat. The tumor consists (see Fig. 8) internally of a thin serous

mucoid mass, which escaped as it was opened. The interior of the "cyst" is made up of a thin, soft membrane, yellowish brown in places, for the most part thin as paper, but here and there consisting of softer, papular masses closely packed and resembling small papillomas.

Microscopic examination. Microscopically the tumor has a homogenous typical structure. It is made up of a richly cellular epithelium, massed together as tubercles, heaps, or roots. These heaps are mostly solid, but also cystic, the latter being due to necrosis of the center, and may be seen in its different stages of degeneration. Especially characteristic are the centers of the heaps. Here we find a mucoid degeneration of the cells, which are more or less star-shaped, surrounded and separated by vacuoles with mucoid contents. The shape and arrangement of the cells is peculiar. The peripheral cells are tall, columnar, in places even prismlike, decreasing as they merge into the heaps. The degeneration (necrosis) and the subsequent cyst formation in the center of the heaps is as a rule not very marked, but may in places have formed large cysts with walls (see Fig. 9) made up of only one or two rows of columnar cells. The boundary line between epithelium and connective tissue is not very distinct, and the appearance of the inner, solid parts of the tumor resembles very closely a squamous epithelial cancroid. The tumor is, however, well limited, surrounded by a fibrous rim or capsule, and its struma is not inflamed or infiltrated, but consists of numerous large cells resembling connective tissue.

FIG. 9.

Adamantoma. (Zeiss obj. D, oc. 1.)

Conclusions. The structure of this tumor is that of a typical adamantoma. It is not a carcinoma, which would have been exceptional considering the patient's age of fifteen years. Its rapid growth, however, is peculiar, but only apparently so, because the tumor was undoubtedly congenital. The age of the patient is noticeable; these tumors appear as a rule only at a more advanced age. Finally, it must be considered remarkable that the real tumor tissue was reduced to small heaps, while the principal parts of the "tumor" had been converted into a cyst.

CASE IV.

In March 1913, I received from Dr. Holmsen, Trondhjem, a microscopical specimen for diagnosis. It was taken by the surgeon in chief, Dr. Alexander Halst from a tumor extirpated in a lady of forty years. It was as large as a Spanish nut, solid, hard, not ulcerated, and started with a broad base from the alveolus of a molar. This tumor had developed slowly and insidiously; it was accidently detected and immediately removed. Up to October 1914 it has not reappeared.

Microscopic examination. Microscopic examination shows a tumor of homogeneous structure. It consists of exceedingly numerous, closely packed, round and oblong, mostly tubular alveoli with branching offshoots. These are filled with well-defined epithelial cells, which on the margins of the heaps are cylindrical and arranged in palisades, and which toward the surface present themselves as vertically placed rows. In the interior of the alveoli the cells diminish in size, become more atypical, and partly assume abnormal shapes. In the long alveoli, for instance, they become spindle-shaped and arranged in long outlines resembling connective tissue cells; in other portions they become star-shaped, are more swollen, and resemble cells in a mucous tissue. Very characteristic are the accumulated products of degeneration deposited in the alveoli, looking like round, heavy drops in or between the epithelial cells. The alveoli are seen in different stages of transition, up to large round spaces filled with mucoid, finely granular masses, while their borders are surrounded by multiple layers of epithelium, internally squamous, externally arranged in palisade-like columnar rows. About the struma, which resembles connective tissue, there is nothing remarkable. The structure is identical with that of the enamel germ.

A diagnosis of adamantoma was given.

Conclusions. We have here a small, compact tumor of comparatively speedy development, conforming with the usual growth of this rarest form of adamantoma; up to the present time only about fifteen such cases are on record.

Cystic Osteo-myxoma of Mandible.

Of an entirely different nature was a case of cystic tumor of the lower jaw, a cystic osteo-myxoma, which, however, had some apparent points in common with the first case of adamantoma:

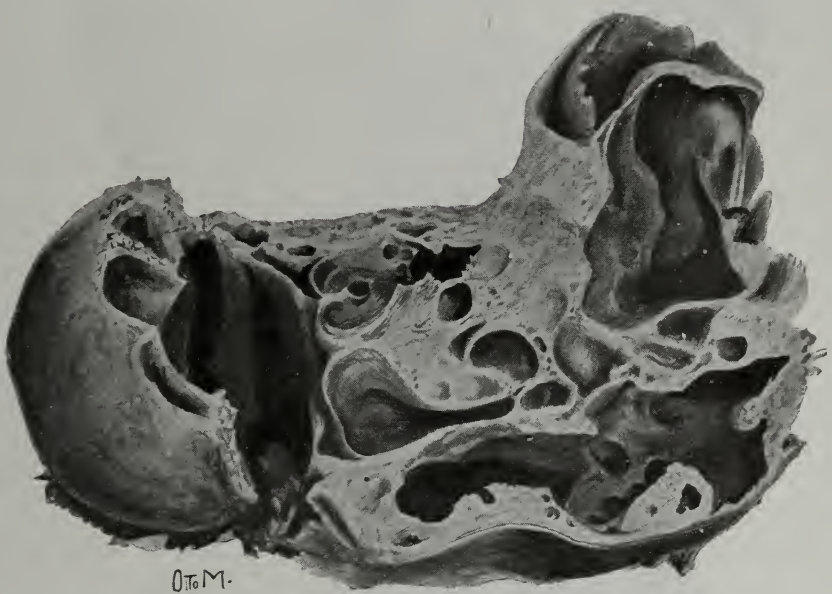
FIG. 10.

CASE V.

Dr. Huitfeldt sent the resected half of a lower jaw containing a large tumor which had been removed from a man of fifty-seven—K. O., Torpen, Land. It had developed slowly during the last eight years. It was mainly situated in the ascending ramus of the left mandible (see Fig. 10), and in the outer two-thirds of the horizontal body of the bone. The condyle was almost destroyed. The tumor bulged inward into the cavity of the mouth, to about the median line, and caused pressure inward and to the right upward. Speech and deglutition were greatly impeded. A fistulous opening

had also forced its way into the cavity of the mouth. Through this fistula a mucoid, viscid fluid was leaking continually. The tumor had also spread outward, forming a nodular, dented mass. Occupying a smaller part of the cheek, a larger cystic, thin-walled prominence was bulging, in which, however, no bone could be felt. No infiltrating growth could be found, nor could any metastasis be demonstrated. The neoplasm was removed in its entirety. Eyde-Evensen, a dentist, supplied the patient with a prosthetic appliance, anchored to some lower right remaining teeth. This prosthetic appliance was first made with a horizontal and a vertical branch, but as a suitable joint for the latter could not be secured, it was removed, and the horizontal branch was changed so as to end posteriorly in a ball resting directly on the soft parts. Artificial teeth were placed in the upper and lower jaw. Both functionally and cosmetically, the results were gratifying. The tumor consisted of the removed left half of the lower jaw with some muscles and fasciæ. It is of very irregular form, and is made up of a conglomeration of cysts, which have changed the normal conditions to such an extent that even the condyloid process can hardly be recognized. The size of the tumor from before backward is 12 cm.; from side to side from 5 to 6 cm.; from above downward 7 cm. The hemispherical prominences are grayish white in color and are surrounded by a thin osseous capsule or shell, which in places crepitates on pressure. No infiltrating tumor tissue is found outside of the jaw.

FIG. 11.



Cystic osteo-myxoma.

On section the tumor is seen to consist of a conglomeration of larger and smaller cysts, which as a rule intercommunicate, and which are filled with grayish white viscid contents. (See Fig. 10.) The cyst walls are smooth, partly tubercular. In the walls themselves, where they are very thin, numerous small points are observed indicating commencing degeneration and cyst formation. No papillomatous excrescences or teeth could be demonstrated in the cysts, but in places smaller cysts

Fig. 12.

Cystic osteo-myxoma. (Zeiss obj. A, oc. 1.)

Fig. 13.

Cystic osteo-myxoma. (Zeiss obj. D, oc. 1.)

could be seen projecting from the walls of the larger ones. The center of the tumor is the softest portion; here the walls contain only a few small, osseous remnants; while toward the surface they become firmer and osseous to a great extent. No swollen or infiltrated lymph glands could be demonstrated in the extirpated material.

Microscopical examination. In different partly decalcified specimens taken from the cyst wall we observe the same picture in its main features (see Fig. 11): A myxomatous tumor-like tissue with more or less numerous star-shaped or fibroblast-like cells separated by a homogeneous or striped intercellular substance. Here and there in the cyst wall osseous lamellæ are observed, surrounded by rows of osteoblasts, partly containing a cartilaginous nucleus. In places more compact bone tissue is seen, in others the lamellæ are more or less destroyed by osteoblasts. The tumor-like tissue has a regular and homogeneous structure; no richly cellular, sarcomatous areas are seen. (See Fig. 12.) The cysts are formed by mucoid degeneration of the original matrix, and are lined internally by a fibrous or mucoid coat, often arranged in a single layer as a thin membrane resembling an endothelial lining. No epithelium was present. A diagnosis of cystic osteo-myxoma was given.

Conclusions. This tumor belongs to the typical class of slow development and characteristic structure. Its great resemblance to the adamantomas is striking, especially in view of the mucoid degeneration, which in both kinds of tumors constitutes the beginning of cysts.

The described cystic osteo-myxoma, with its peculiar appearance and structure, is very seldom encountered.

A NEW METHOD FOR INDICATING NORMAL AND ABNORMAL RELATIONS OF THE TEETH TO THE FACIAL LINES.

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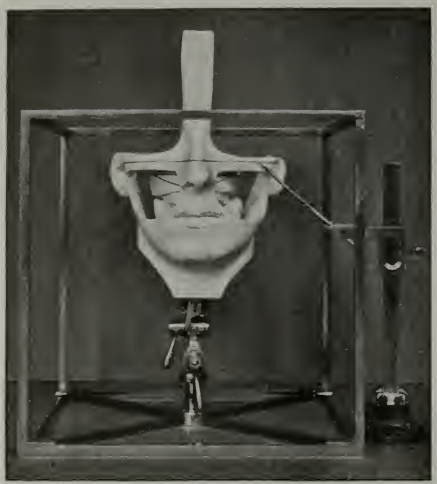
(Continued from page 983.)

(II.)

APPARATUS FOR THE STUDY OF SKULLS AND HEADS.

NOW that we have succeeded in reproducing the patient's head with the teeth in exact relation to the facial lines, we come to the second part of our problem, viz. What position do we give the head in the cube? One who would have a clear idea of the malocclusion of the teeth and of the facial lines must make comparative studies of skulls or of the heads of patients, and the first requirement is that these skulls or heads always be arranged in space in the same way. The importance of this appears if one compares the prognathism of a skull studied according to various horizontal planes, such as the Frankfort and Broca horizontal plane. The physiognomic impression of a face seen from the side depends largely on the position given to the head. The more the head leans backward the more does the maxillary region remind us of the projection of the jaws in animals. To avoid these errors, anthropologists have adopted planes: A skull or head must be meas-

Fig. 6.



CUBUS CRANIOPHOR.

Fig. 7.

Fig. 6: *Cubus craniophor*, with plaster facial cast and model in the right position, adjusted according to the Frankfort horizontal line. Both tragia are brought to the same height by moving the head in the second joint.

Fig. 7: The same head, side view, adjusted according to the Frankfort horizontal plane. The tragion and the orbitale are brought to the same height. In this position of the head a line is drawn on the upper model parallel with the Frankfort horizontal line, and the top of the model is bladed off along this line.

Fig. 8.

Fig. 9.

Fig. 8: Rotation of the head around a frontal axis in the first joint forward.

Fig. 9: Rotation of the head around a frontal axis backward in the first joint. Compare the facial line in Figs. 8 and 9. The model is removed to show the piece of impression compound on which the upper model rests.

ured in three planes, a horizontal, a median (sagittal), and a frontal plane—the three planes of the *cubus craniophor,* the instrument which enables the observer to place all skulls in the same position for purposes of study.

This cubus craniophor (Fig. 6) consists of metal ribs representing an absolutely correctly constructed cube. In the basal plane, further, are two metal

FIG. 10.

FIG. 11.

FIG. 10: Rotation of the head around a sagittal axis in the second joint.
FIG. 11: Rotation of the head around a vertical axis in the tube on the basal plane of the cube.

diagonals, at the intersecting point of which a tube perpendicular to the basal plane is arranged, wherein the skull-carrier proper can be moved up and down. The upper part of the skull-carrier consists of a clasp, with which the skull or the plaster cast of a face can be firmly held (see Fig. 7). This clasp itself is movable on its basis on a hinge-like joint, the axis of the joint standing perpendicularly to the longitudinal axis of the head. This joint can be fixed in any position by means of a screw. In this joint the head in the cube turns around a frontal axis so that it can be given various positions in the median (sagittal) plane (see Figs. 8 and 9). Under this first joint lies a second hinge-like joint the axis of which runs parallel to the longitudinal axis of the head. This joint can also be fixed by means of a screw. When the first joint is fixed, the second joint permits movements of the head around a sagittal axis whereby the head assumes various positions in the frontal plane (see Fig. 10). This second joint rests on a cylinder so that the entire combination of hinge-like joints can move up and down in the tube on the basal plane of the cube. In this tube the facial plaster cast can thus be turned around a vertical axis so as to assume any position in the horizontal plane (see Fig. 11). This joint can also be fixed in any position by means of a screw. Finally, as a fourth movement, one can move the head up and down in the tube, whereby it comes to rest at a greater or smaller distance from the basal plane of the cube. The cube is now fixed on an absolutely horizontal marble slab—lying al-

ways in the same position, and every head being placed in the cube in the same manner—as follows:

The right and left *porions* of the head are placed at the same height in relation to the basal plane of the cube by means of a tracing-tool that brings the two points of the head to an equal height through the movement of the head in the second hinge-like joint by which the head turns around a sagittal axis (see Figs. 10 and 6). The porion is the point in the center of the upper margin of the *porus acusticus externus,* and can be found easily on a skull, but not *in vivo;* therefore we take the *tragion, i.e.* the upper margin of the tragus of the ear, which point lies at the same level as the porion. When the tragia, left and right, are placed at an equal height, we fix the second joint with a screw, and the head is then adjusted in the frontal plane. Afterward, by moving the head in the first hinge-like joint, one brings the right and left tragion to the same height as the *orbitale,* left or right, by means of the tracing-tool, whereby the plane that goes through both tragia, and one orbitale lies horizontal and parallel to the basal plane of the cube. The orbitale is the lowest point of the inferior margin of the orbit. One can now also fix the first joint with the screw. Thereby we have arranged the head in the frontal and sagittal plane—in fact, according to the horizontal plane of the Frank-

Fig. 12.

The facial plaster cast standing on the table is the same as shown in the cubus craniophor. The base is bladed off along a line parallel with the Frankfort horizontal line. To the right, the model belonging to this facial plaster cast with the top and base bladed off according to my method, parallel with the Frankfort horizontal line. To the left, the same model with the top and base bladed off along a line parallel with the plane of occlusion (old, wrong method). Notice the difference of the front aspect in both models.

fort agreement of craniologists and used in anthropology. In this way the head is brought into a position that approaches most nearly the physiological horizontal position, *i.e.* the natural unstrained position in which the normally erect-standing man holds his head when the head is found to be in exact equipoise; that is, in a position in which we commonly see the head (see Figs. 6 and 7). If it is wished to determine the degree of prognathism of a patient, or to compare with regard to prognathism different persons with one another, then the head must be placed in the manner described.

In Figs. 4 and 6 the Frankfort horizontal line, indicated by a line on the facial plaster cast, is clearly seen. If now, with the tracing-tool, we draw a line parallel with the Frankfort horizontal plane around the base of the facial plaster cast where it is held fast by the carrier, and the base is bladed off along this line, then we can place the head on this basal plane on the table, and we have the head adjusted in accordance with the Frankfort horizontal plane. Other positions of the facial plaster cast are now impossible (see Figs. 12 and 13). As we want the facial lines in the middle of the face, the Frankfort horizontal line and the lower margin of the lower jaw, we do not take an impression of the entire face, but cover with plaster only the middle part of the forehead, the bridge of the nose, the mouth and the middle of the chin, also the lower margin of the lower jaw and the region from the tragion to the orbitale. The positive cast then gives us the form of the facial plaster cast that is shown in the cube. The tragion is always easily found; the orbitale is determined on the

FIG. 13.

The facial plaster cast with the same model trimmed according to the new method (right) and the old method (left). This facial plaster cast is the same as shown in Fig. 4 from the side.

patient, and a small piece of silk ligature is fixed with some cream along the lower margin on the orbit of the skin. This piece of silk comes off in the negative impression, and indicates in the positive cast the place of the orbitale. When we have adjusted the head in relation to the frontal plane of the cube (frontal plane) and to the side plane (sagittal plane), we can moreover so place the head that its median plane runs parallel with the side plane of the cube. In anthropology, the median plane of the skull is found by means of putting the cube on its side plane and then bringing the following three points to an equal distance from the basal plane of the cube, *i.e.* the *nasion* (intersection of the *sutura naso-frontalis* with the median plane), the *inion* (the point where one finds the union of the *lineæ nuchæ superiores* in the median plane) and the *basion* (the point where the foremost margin of the *foramen magnum* is intersected by the median plane). It is not possible to indicate the last two points *in vivo,* and it is better to follow another method, as follows:

Place the cube on its side plane, and when, first of all, on the top plane of the upper model the line of intersection of the median plane of the upper model has been obtained by means of my symmetroscope, then the head can be turned in the tube so that the tracing-tool follows this line precisely. One then knows that the median plane of the head, and also the raphe, runs parallel with the side plane of the cube. We then fix the joint with the screw, and set the cube again on its basal plane. When one has now placed the head, in the manner described, in the cubus craniophor, then the facial lines in their course in relation to the Frankfort horizontal plane can be noted; the piece of impression compound which is an impression of the palate has then also a fixed position in relation to the three planes of the cube, and with it the upper model as it is placed on the piece of impression compound.

The occlusion indicates the relation of lower to upper model, so that, if the lower model is fixed to the upper model with wax in the occlusion as found in the patient, the model reproducing the teeth, palate, and alveolar process is then adjusted in relation to the three planes of the cube, while the head and the teeth are adjusted in relation to the Frankfort horizontal plane. All malocclusions can now be judged in relation to the Frankfort horizontal plane. We now proceed to indicate the top of the upper model while it rests on the piece of impression compound, by scratching with the tracing-tool a line around the "art" portion of the upper model. This line reproduces the line of intersection of a plane with the upper model which runs parallel with the ground plane of the cube or with the Frankfort horizontal plane. One can see this line clearly indicated on the upper model in Figs. 4 and 6, running parallel with the Frankfort horizontal line indicated on the facial plaster cast. Along this line the upper model is bladed off; afterward one sets the lower model in correct occlusion against the upper model, places the upper model on its top and scratches a line with the tracing-tool around the "art" portion of the lower model. Along this line, the lower model is bladed off, and now the top and base of the model run parallel with each other and parallel with the Frankfort horizontal plane of the head (see Figs. 12 and 13, right).

Now, if the head has been so placed in the cube that the median line and also the raphe run parallel with the side plane of the cube, and we turn the cube over on its back plane, and scrape, around the back part of the model *in situ,* at a certain distance from this basal plane of the cube, a line along which the model is to be bladed off, we shall have constructed the back plane of the model, and now have it running parallel not only with the back plane of the cube, but also standing perpendicularly on the median plane of the model, perpendicularly on the Frankfort horizontal plane, and perpendicularly on the top and base of the model. The front plane of the model can now be easily

made parallel with the back plane. The side planes of the models are then cut perpendicularly on the upper and back planes parallel with the median plane (see construction by means of the symmetroscope) so that the outline of top and base of the model forms a rectangle. When one has constructed the top of the model and indicated the line of intersection of the median plane on the model with my symmetroscope, then the back plane, front plane, and side planes of the model can all be cut perpendicular to each other by means of the planing machine to be described, so that the turning over of the cube on its back plane in order to construct the back plane of the model will be superfluous. We have given the "art" portion of the model a form whereby the various planes stand precisely perpendicular one on the other, and run parallel with the planes of the cube that was used for adjusting the head and the teeth in the Frankfort horizontal plane. The planes of the model have by this method become absolutely exact planes for the judgment of deviations of the teeth in relation to other parts of the skull lying externally to the teeth in the position given by the Frankfort horizontal plane. If we now take the model out of the facial plaster cast, and place it with its back plane on the marble plate against a metal bar that runs in the same direction as the back rib of the cube, then this model indicates exactly the position of the teeth while the head to which the teeth belong was adjusted in the Frankfort horizontal plane (see Figs. 12 and 13). As all models are constructed in the same manner, we can compare the deviations in various models, as well as the facial lines of various heads (see Figs. 12 and 13). It is now possible to judge the teeth in relation to the planes of the model. The occlusal surface of each unit of the upper jaw can be judged in relation to the top and in the lower jaw in relation to the base of the model, both running parallel with the Frankfort horizontal plane. Every tooth can now show the same deviations in relation to the planes of the model as the head in relation to the planes of the cube. The direction of the occlusal surface in a sagittal plane can run parallel with the top or base of the model, or it can incline therefrom (mesial and distal inclination of the molars and bicuspids; labial and lingual inclination of the front teeth). In the frontal plane, the occlusal surface can run parallel with the top or base of the model, or it can incline therefrom (buccal and lingual inclination of the molars and bicuspids, mesial and distal inclination of the front teeth).

In the horizontal plane, the occlusal surface can turn, producing rotations of the teeth around a vertical axis.

Finally, the occlusal surface can be either nearer to or farther away from the top or base of the model (elongation and shortening of the teeth).

Here we have the seven elementary deviations that each tooth can show, judged in relation to the Frankfort horizontal plane. The combination of the occlusal planes of all the elements of the upper or lower jaw, in deciduous teeth as well as in permanent teeth, forms the level of the upper or of the lower teeth. This level forms a certain curve that runs entirely differently in the upper teeth from that in the lower, while at the same time a difference exists between the level in the front part and the side parts. The level of the teeth can now also be gaged in relation to the top and base of the model. It can run parallel therewith in a frontal and sagittal plane, or the level can incline in a sagittal plane (for instance, the level of the bicuspids is farther away from the top of the model than the level of the molars, or *vice versa*), or the level can incline in a frontal plane (for instance, to the right, the level is farther away from the top of the model than to the left, or *vice versa*). These last deviations, *i.e.* in a frontal plane, Körbitz is able to find by means of his method, but not the deviations in the sagittal plane. The occlusal plane of the set of teeth, *i.e.* the plane of contact of the occlusal surfaces of the lower teeth with the upper teeth means natu-

Fig. 14.

Fig. 15.

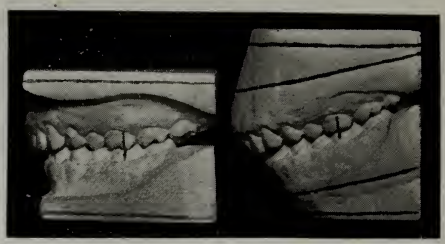
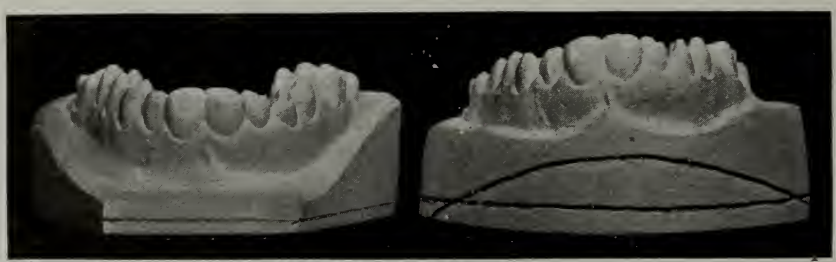


Fig. 14: Side view of the model belonging to the facial plaster cast shown in the cubus craniophor. Left, the old, wrong method, with top and base parallel with the plane of occlusion. Right, the model according to my method. Notice the difference in inclination of the level of the teeth in the sagittal plane. Notice also the difference in inclination of the front teeth.

Fig. 15: Side view of the model belonging to the facial plaster cast shown in Fig. 4. Old method, left; new method, right.

Fig. 16.



The same upper model belonging to the facial plaster cast shown in the cubus craniophor. To the left the top of the model is bladed off parallel with the plane of occlusion. To the right the top is bladed off parallel with the Frankfort horizontal line. Notice on the right model the difference in level on the right and the left side in relation to the top (Frankfort horizontal line). In the left model nothing of this asymmetry is seen.

Fig. 17.

The same lower model with right first molar extracted. The back plane in the left model is trimmed parallel with the distal surface of the last elements of the arch; left, the second molar; right, the third molar. On the right model the back plane is constructed perpendicularly to the median line. Notice the difference in curve of the two arches.

rally something entirely different from the level of the teeth. Only on a set of teeth with edge-to-edge bite is the occlusal plane of the teeth the same as the level of the lower or upper teeth; in all other sets of teeth they differ. The relation of the line of level to the horizontal plane can be the consequence of the relation of the teeth to the jaw, but also the consequence of an inclination of the facial skull in relation to the base of the skull. Whether the less or greater angle of the base of the skull is to be viewed as causal of orthognathism and prognathism is a point which orthodontists do not pay sufficient attention to. In Figs. 15 and 13 are shown side by side the models of a patient's teeth whose head is reproduced in Figs. 4 and 13, trimmed according to the usual method (left), and by my method as described (right). One notices the difference in the level of the teeth in a sagittal plane as it really exists, and the idea obtained from the model trimmed by the method hitherto followed. On the upper and lower model trimmed according to my method a line is indicated that runs parallel with the top and base and with the Frankfort horizontal plane, while the line that forms an angle with the top and base represents the line of intersection of a plane that runs parallel with the occlusal plane and that by the old method forms the top and base of the model. By a comparison of the course of these lines, the great mistake we make by the present method of model construction becomes apparent. In Figs. 12 and 14 one sees the same differences in the model of the head in the cube. Notice the degree of inversion of the upper front teeth as it actually exists, and as the model trimmed according to the method hitherto followed shows them, whereby the front teeth seem rather to stand in inversion. In Fig. 16 (right) one can note the deviations in a frontal plane as they really are, and as they appear according to the method hitherto followed (left). This upper model also was made from the head reproduced in the cube.

ADVANTAGES OF THE WRITER'S METHOD.

From the above it appears that the illustrations of models in Angle's standard work, and indeed in all works on orthodontia, reproduce very unsatisfactorily the true position of the teeth. If a case of open bite is to be corrected, this can be achieved by the elongation of the front of the upper jaw or by the elongation of the front of the lower jaw only, or of both jaws. By the old method one can never see what has happened, neither from the model nor from the illustration thereof. The orthodontist can come to all three conclusions, depending on how he holds the model; according to my method, however, the effect of the treatment appears at once. It seems to me that by the application of my method of examination we can obtain a much better insight into the normal arrangement of the teeth, especially as regards the line of level, by taking a facial plaster cast of the same child at different ages with the teeth in the right relationship.

This line of level of the teeth appears to be of exceptional interest for orthodontists as it presents the result of the different forces acting on the teeth—a fixed line of level belongs to a definite equilibrium of the teeth.

(To be continued.)

A CONSIDERATION OF SOME OF THE PRESENT TENDENCIES IN DENTISTRY.

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(Read before the Dental Society of the State of New York, at its annual meeting at Albany, May 13, 1915.)

THIS paper is not intended as an effort to harness enthusiasm or to put a brake on progress. It is merely an invitation to the thinking men of the profession—possibly it might be better to extend the invitation to the unthinking men in the profession—to consider somewhat carefully certain tendencies which seem particularly apparent at the present time, and which your essayist believes would be the better for a rather rigid and unbiased interpretation.

ANALGESIA.

A year ago I had the honor of standing on this floor, and remarking in a discussion of the splendid report of your Correspondent that the practice of analgesia with nitrous oxid and oxygen did not appeal to me as a routine and regular method of procedure in filling teeth. In taking this position I found myself opposed to the opinion of some men prominent in the profession, and for whom personally I had a very high regard; but I take it that it should be a tenet of every man's professional faith that in the discussion of scientific subjects the matter of personal predilection should not be permitted to dominate a man's expression of opinion. What I thought of analgesia then I still think of it, and it may not be amiss for me to venture on a brief explanation of the reasons why I am in a measure opposed to it. I say advisedly "in a measure," because I would not have it inferred that I am sufficiently hidebound in my convictions that I fail utterly to see any virtue in a method which has for its aim the amelioration of suffering during dental operations. I will go even farther, and admit that there may be some cases which cannot be so successfully controlled by any other means as by analgesia. And yet to my mind these are only the exceptions which prove the rule, and these exceptions do not in any measure alter my conviction that the general introduction of analgesia for the ordinary operations which we perform each day, such as cavity preparation, trimming roots for crowns, etc., would do infinitely more harm than good.

My reasons for making this statement are based on several considerations: (1) The impracticability of the process—a charge which I have never before seen made against it; (2) the possible detrimental effects on the patient; (3) the danger of approaching too close to the pulp in cavity preparation, and (4) its demoralizing influence upon the stamina of the patient.

As to its impracticability, it is only necessary to note the fact that many of the operators, it is quite safe to say, who took it up most enthusiastically in the beginning, use it less and less as time elapses. The chief reason for this must be that it is not practical; that it has certain limitations which interfere with its successful operation. After these years of testing-out, if it were practicable it would be used more today instead of less. There is something wrong with a method of practice which steadily loses ground after the crucial test of experience.

Its possible detrimental effect on the

patient may be manifested in various ways. When patients are kept partially under the influence of an anesthetic for a sufficient time to permit of cavity preparation or similar operations, and when this is done as routine practice, it is difficult to estimate the injury that may result. To say nothing of the headaches which are frequently complained of by the patient, there is another factor not usually considered, but which is really worthy of some attention, viz, the possible effect on those patients whose blood pressure is high, many of whom are not aware of this condition till something serious has happened. It is not well to cry "Wolf, wolf!" at the suggestion of every new method of practice, and yet with a thing as radical as analgesia the operator should proceed with great caution lest he permanently injure his patient.

The danger of approaching too near a pulp in cavity preparation is not a fanciful one, as has been demonstrated in several instances which have come under the writer's observation. I have seen at least two cases where pulps were needlessly exposed under analgesia, in each of which it was found necessary to remove the filling on account of pain, only to find the pulp dying. These were both in cases where the cavities were so small that there would have been no exposure if analgesia had not been used. This cannot be considered desirable practice.

Another unfortunate feature of analgesia is that it caters to the dependence and lack of stamina of the patient. I do not by any means argue for the infliction of pain to develop courage on the part of the individual. But I do assert that in most of the routine work of dentistry the pain need not be so great that it works an injury to the patient or calls for a systemic numbing of the nerves, and that the lure of this practice held out to people will in many instances tend to minimize their self-control, and unfit them for meeting some of the other emergencies of life when they are thrust upon them. If we could insure every individual that he would never be called upon to endure hardship of any sort there might be some justification for humoring his every whim, but this is against all human experience, and the pampering of people beyond a reasonable limit is demoralizing in every way. I am aware that I shall be misunderstood, and mayhap misquoted in venturing this statement, and so I must hasten to make it clear that I am an advocate of the utmost consideration and kindness in the treatment of people when they are obliged to encounter disagreeable experiences such as the performance of dental operations. Indeed, my chief contention is that there has not been sufficient consideration and kindness in the past, a fact which in part is accountable for much of the dread of the dental chair. Had dentists always been considerate, careful, and skilful, there never would have been any demand for such a practice as analgesia for filling teeth, and my advice to the dentist of today is to go back to the old-fashioned tenet represented by painstaking care, kindness, and delicacy of manipulation. If he will couple these with a constant study of human nature, he will meet all the contingencies of everyday practice without resort to so radical a procedure as analgesia.

PROPHYLAXIS.

In considering the tendencies of the day it may be well to refer briefly to the method of practice so extensively known as "prophylaxis." The very name appeals to one as a most commendable thing in dentistry. To prevent disease is more laudable always than to cure it, and our chief efforts should be centered in this direction. But in his wildest day-dreams the man who first called attention to this practice, Dr. D. D. Smith of Philadelphia, never imagined the extent to which it was to be carried by some practitioners. To conscientiously remove deposits from the teeth and polish the surfaces smooth and bright where they have become stained and roughened is a legitimate and altogether worthy method of practice: to stimulate patients to better care of the teeth, and

to have constant surveillance over conditions in the mouth by frequent stated inspections must be considered a policy of reason and conservation. But to ruthlessly go into a mouth with stones and disks and strips, and to grind and cut and slash as is being done by some operators is wholly unwise, and in certain instances borders almost on malpractice. To pass a sandpaper strip between the proximal surfaces of teeth whose only sin is that they are somewhat stained, and to saw this strip back and forth in the interproximal space, lacerating the gum to shreds, and cutting into the tooth tissue in the gingival region; to go even farther than this, and force the strip between the bifurcations of roots, with the idea of trimming down and polishing these surfaces, is to exceed the function of rational prophylactic treatment, and in many instances to do more harm than good. This laying bare of the necks of the teeth by grinding and the use of abrasives frequently leaves the teeth so sensitive that the patient is rendered extremely uncomfortable. There is no need for creating this discomfort if the operator will go about his prophylactic work with reason and judgment, removing the deposits most carefully with delicate instruments, and polishing and smoothing the tooth surface without cutting and slashing into it as if it were so much inert matter. To transform a mouth from a state of disease to one of health by prophylactic treatment, and to do it rationally, is a process extending over some time instead of a radical and immediate operation of the "presto!—change" character. And this can be done without subjecting the patient to intolerable pain or subsequent discomfort.

Another consideration connected with the practice of prophylaxis relates to the folly of instituting treatment of this sort in a perfectly healthy mouth. This is frequently done on the plea that it will prevent disease of the gum and decay of the teeth, and the promise is confidently made by the dentist and naïvely accepted by the patient that if prophylactic measures are followed once a month there will never be any caries or pyorrhea in that mouth. The burden of preservation is thereby placed upon the dentist instead of being placed where it properly belongs, upon the patient. It is the daily care the patient gives the teeth, rather than the monthly care of the dentist, which counts most for the maintenance of health, and this should always be emphasized in any discussion of the matter with the patient.

Not only this, but to institute so-called prophylactic measures in a mouth where the gums are normal and the teeth in need only of ordinary cleaning is likely to do decided harm. To lacerate these delicate gum margins by instrumentation is in many instances to start them on the road to the very diseases which the dentist is so anxious to avoid; in fact, one of the functions of the dentist today is to guard his patient against injuring the gums by injudicious or wrong use of the brush in the patient's own hands. It is as valuable to teach the patient how to properly care for the teeth himself, so that he may do his part successfully, as it is for the dentist to operate skilfully in doing his part.

Then, again, to promise a patient that there will be no decay of the teeth if prophylactic measures are instituted each month is a hazardous thing to do. In some mouths where the influences of susceptibility are especially active, cavities will occur at times despite our best efforts, and when this happens it must call for some very ingenious explaining on the part of the dentist. Fortunately for themselves some of our colleagues are really very ingenious at this kind of explaining; but it would assuredly be better for their subsequent equanimity if they were frank enough at the outset to say to their patients that, while prophylaxis was a most excellent procedure under its proper indications and would aid greatly in minimizing the tendency to decay, there was yet no panacea or absolute preventive for dental caries known to man. This would be safer and I venture the assertion that it would not lessen the ultimate respect the patient has for the dentist or for prophylaxis.

PYORRHEA ALVEOLARIS.

To proceed from a consideration of prophylaxis to that of pyorrhea alveolaris seems a natural sequence, in view of the close connection between prophylactic treatment and the prevention of pyorrhea. There can be no question that the proper observance of prophylactic measures in mouths where the incipience of pyorrhea has manifested itself will be of immense value in limiting the disease. Indeed it may safely be said that with all the furor in the way of systemic treatment, either by the vaccines or by the much-heralded emetin, the chief reliance for the control of pyorrhea must rest at present with proper local management of the case. And this at once brings us face to face with the question as to whether or not emetin is living up to the great promise made for it in the beginning. If we study the history of the use of this remedy we will see repeated the experience of many other remedies for many other diseases. When emetin was first introduced by Drs. Smith and Barrett of Philadelphia, their claims for its use read quite conservatively, and while their reports seemed to show a very encouraging result, yet there was a cautious tone to all they said, which if heeded by the profession would have resulted in a saner acceptance of the remedy. But while Smith and Barrett stated that emetin "seemed" to bring certain results, some of those who followed them stated that it *did* bring these results, and worse yet, certain men got the ear of the public press and heralded the glad tidings that at last there was a specific remedy for that almost universal disease—pyorrhea alveolaris. As my good friend Dr. Hofheinz of Rochester remarked, "There seems to have developed a widespread impression that the only thing to do to cure pyorrhea is to inject emetin into the patient."

At this stage of our experience it seems difficult to assign to emetin its proper status as a remedy for pyorrhea. Some men continue to report encouraging results from its use, while others just as careful and as skilful see little of merit in it. There is one confusing feature of this question which should be cleared before any estimate is passed upon the virtue of a drug or method advocated for pyorrhea. The claim that a certain treatment will stop pus formation in the mouth is no evidence that it will save teeth from being lost through failure of the supporting structures of the teeth. In fact I am going to be sufficiently heretical to say that the problem of stopping pus in pyorrhea pockets is not and never has been a very serious one, provided the operator may have the co-operation of the patient. And this can be accomplished wholly by local treatment. The great problem, and the one which I believe to be baffling most men today, is to prevent the constant and insidious loosening of the teeth by a solution of the pericemental membrane and alveolar process without any evidence of pus formation at all. This goes on in some cases despite the most careful local treatment that we are able to institute. It is a condition in which other things are involved than the mere presence of deposits, because the deposits may be removed as carefully as can be done by the hand of man, and yet the teeth grow steadily looser. It is light upon this peculiar condition that we need more than anything else today, and when this light comes I venture the prediction that it will be found to be something systemic; and to go one step farther, I imagine that it will have to do with some form of faulty metabolism or elimination.

The most unfortunate thing connected with the present status of the emetin treatment is the false hope that has been fostered in the mind of the public that a panacea for pyorrhea has been discovered. Quite naturally those afflicted with this disease will catch at any straw which promises salvation, and the confident way in which the papers have stated that a simple cure has been found will mislead many people, and result in their ultimate disappointment. Any deception of the public which has the semblance of exploitation reacts in an

unfortunate way, and increases distrust which is hard to live down. The best interests of the profession and the people are conserved only when there is perfect confidence established on both sides, and experiences such as we are having with the emetin treatment are not conducive to this end.

ROOT-CANAL WORK.

The intense interest which has been excited in recent years regarding the possible effect on the system of badly treated pulpless teeth has stimulated the profession to renewed efforts in the direction of better root-canal work. This is a movement in the right direction, and it came none too soon to save the reputation of the profession. The numerous travesties on root-canal fillings that have been made to pass muster heretofore would be a serious reflection on the profession had the real gravity of the situation been apparent. Few men realized that anything more disagreeable or dangerous than an alveolar abscess was likely to follow bad root-canal work, and so slipshod methods were allowed to prevail with many operators, who were content if their treatment did not immediately result in the formation of an active abscess. But the severe and justifiable strictures passed upon this kind of dentistry by the medical profession and by a certain section of the dental profession has "given us pause," and made us reflect that an improvement in our operations must be made if we are to save our reputation. It is safe to assume that there has never been such a general awakening as there is at present on the subject of proper root treatment and filling, and a close study of the technique of this operation is being more generally made than ever before.

This is by no means an acknowledgment that in the past this work has been entirely neglected or ignored by the profession. Many men from the very beginning of the practice of root-filling have devoted their best energies to it, and have conscientiously lived up to the highest of their understanding. In the hands of men of this type there has been little menace to the welfare of the patient as the result of root-filling, and the present crusade is directed mainly against that large membership who slight this operation, and content themselves with any kind of technique that will cover up their tracks temporarily. The strongest censure that can be passed upon this sort of work is none too severe, and the united efforts of the profession should be devoted toward the elimination of such methods of practice.

But let us turn for a moment to the other side of the picture. There is grave danger at the present time that serious harm is to be done in the name of so-called reform. It seems to be a proclivity of human nature not to be able to bring about any reform without overdoing it, and in some instances the enthusiasm of the reformer leads him into follies as serious as the evils he is trying to combat. When the realization was forced upon the profession that neglected or badly treated pulpless teeth were a menace to the health of the individual through establishing local foci of infection which might affect the entire system, the chimeric vision of some men carried them on to the conclusion that every pulpless tooth was a menace, and consequently should be removed. In the light of our long experience with the behavior of well-filled pulpless teeth it seems impossible of belief that men can be found who sagely advise the extraction of every tooth which by any chance has lost its pulp, and yet this is really being done today in certain sections. Not only this, but dentists are reading papers before medical societies extolling the practice of extraction, and dwelling on the horrors lurking at the apex of every pulpless tooth. Medical men are naturally only too glad to discover some new explanation of the phenomena of disease which have been puzzling them, and they readily seize on the novel theory that the teeth are at the basis of many of the ills from which their patients are suffering, and which heretofore they have been unable

to fathom. No conscientious man of mature experience would for a moment wish to minimize the ill effects on the system of bad mouth conditions, nor to argue that foci of infection at root-ends were not a serious menace to the patient; but to claim that all pulpless teeth, regardless of whether they were well filled or not, are dangerous to the individual and should be removed is simply to run riot with the evidence of half a century, and to throw ordinary common sense to the winds. The consequence of this crusade of extraction will be disastrous to the people if it is not checked. Hundreds and possibly thousands of teeth innocent of any harm will be sacrificed to the forceps and the people be deprived of their use for life. To accept the dictum that most of the teeth which have lost their pulps cannot be made healthy and useful to the individual is to set dentistry back more than fifty years—to the days when pain in a tooth meant its extraction, when partial dentures followed shortly by full dentures were the rule. Why is it that today there are relatively fewer artificial teeth worn by the population than there were years ago? Mostly it is due to the fact that it has been possible to treat and save pulpless teeth.

As has already been intimated, we need a new consecration to care and thoroughness in the technique of this work, we need to increase our effort and improve our skill; but to say that all this is futile and that when a tooth has lost its pulp it must ever remain a dangerous thing to the patient is to discount and discredit the splendid work done in this line by such men as Callahan, Rhein, Buckley, Best, and scores of others.

Medical men should be taught to be more guarded in their condemnation of teeth. If they are to continue to advise extraction on the evidence of the X-ray as they are doing today, then we must insist that they make themselves more familiar with the phenomena of X-ray pictures of the teeth and jaws. Skiagraphs of the jaws are difficult to properly interpret even by an expert in this especial field, and for one who is not familiar with this work to pass an offhand judgment on a tooth and order its extraction is often to do irreparable injury to the patient.

We should welcome the closest cooperation between the physician and dentist, but we should insist that this co-operation be undertaken solely for the best interests of the patient instead of for the exploitation of some pet theory.

In considering some of the present tendencies in dentistry your essayist has sought to touch on a few of the outstanding things which seem to him to be affecting our profession at this time, and he wishes to repeat what he said at the beginning, that his aim is not to discountenance progress nor to discourage the testing of new ideas. It is only by the introduction of new ideas that the profession can grow, and while the trend of thought and practice in some of the things mentioned in this paper would appear to call for a halt in the enthusiasm of those most interested in them, yet the writer would rather see the extreme of enthusiasm, even with the mistakes concomitant thereto, than to see the profession settled down into a stagnant rut, self-satisfied, and asleep. Good must eventually come from the extremest method of practice, and the only care we must have is to see that too much harm shall not be permitted to creep in with the good.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE VALUE OF CASTING IN CROWN AND BRIDGE WORK.

By W. J. ROBINSON, D.D.S., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, at its regular monthly meeting, May 25, 1915.)

IN the short space of time allotted, I cannot, of course, describe in any detailed manner the value of the casting process, now quite generally used in relation to crown and bridge work, but would simply offer a brief analysis of its salient features.

SIMPLICITY.

The first item I wish to emphasize is the simplicity of construction, not because to my mind this is the most important, but because it appeals most strongly to a great number of crown and bridge workers. The former method of dummy construction involved a greater amount of time, without result comparable to that obtained by the casting method, either in regard to esthetics or to hygiene of the mouth. Furthermore, the amount of solder necessary to obtain the proper contour of the dummies is as undesirable as it is disadvantageous, without adding anything to the finished piece.

STRENGTH.

Some bridge workers claim that the addition of large quantities of solder adds to the strength of a bridge. If this statement is intended to convey the thought that cast bridges are not sufficiently strong because solder is lacking, I fail to find any confirmation thereof in an experience of over six years devoted almost exclusively to the casting method of bridge construction. In fact, cast bridges, when constructed of coin gold or of the alloys found upon the market, I believe are stronger or equally as strong as the former soldered bridges.

HYGIENE.

Although it might be proved that cast bridges are not as strong, this nevertheless does not mean that they are not strong enough for all the purposes for which they are intended. Therefore, irrespective of the greater strength gained in the finished piece by either the one or the other method of construction, the increased hygiene secured in all bridge adaptation by the casting method is in itself a factor of such great importance that the conscientious practitioner must utilize the process in his crown and bridge work for the benefit of his patients.

GREATER EFFICIENCY IN MASTICATION AND BETTER CONTACT RESTORATION.

To the improved hygiene made possible by the casting method we must add the better antagonism between crowns; resulting in a more efficient mastication as well as in the better restoration of interproximal contacts.

Let us consider the adjustment of a shell crown upon the roots of a second molar. The natural crown was of a decided bell shape, with a wide masticatory surface and a much narrower gingival dimension. By the former method, in some instances, it was rather difficult to construct the crown so as to properly restore the interproximal contact; but with the aid of the casting method this is just as easy in the most pronounced condition as it is in normal cases.

ESTHETICS.

The general improvement in the esthetics of crown and bridge work resulting from the utilization of the casting process is now so generally admitted that we need only make reference to it, without citing the many illustrations that could be adduced to substantiate this claim. When formerly avoidance of the display of metal was not possible, it is possible now, or else such display is so markedly reduced as to make the finished appliance a very acceptable and creditable piece of construction.

EASE OF REPAIR.

In order to further strengthen the claims of the great value of the casting method in crown and bridge work, we should point out the ease with which fractures of teeth or facings may be repaired. At times nothing appears to be so embarrassing as the attempted correction of a broken soldered facing; but, with the advent of the casting process and replaceable teeth, repairs are easily made, without in the slightest degree affecting the appearance or usefulness of the crown or bridge.

ADVANTAGES OF PORCELAIN CROWN ON CAST BASE.

In constructing a porcelain crown for any of the anterior teeth, it sometimes occurs that the artificial tooth, in order to aline properly with the natural crowns, must be set beyond the lines of the cap. With the aid of the casting process this is readily effected. Not so with the former method of soldering the facing to the cap, in which two or three investments at times are necessary, before the proper lines can be secured. This type of artificial restoration, where a porcelain crown is utilized in conjunction with the casting process, is without doubt the most ideal method at our command at the present time. It presents all the advantages of the baked porcelain crown, with the additional advantage of easy replacement in case of fracture.

COMPARATIVE TECHNIQUES.

To impress emphatically the great value of the casting process, it is but necessary to compare the technique of bridge work, as followed formerly, with that of the present. Formerly the teeth were ground to position, and held in place with wax and a matrix of plaster. Each tooth was then removed, backed, and the cusps swaged and filed to the facings. After this the teeth were replaced in position according to the plaster matrix, and after the proper antagonism had been secured, the case was invested and soldered. The greatest care had to be employed in the soldering process to prevent checking or fracture of the facings. In following the casting method when utilizing detachable crowns, such as the Davis, Evslin, Justi, or S. S. White, the crowns are ground to position and then moistened with either water or oil. A softened piece of wax is then forced into the opening of the crown, also into the space between the abutments, upon the model. After this has been accomplished, the crowns are forced into this wax, until they are in proper position; the wax is now properly trimmed, the crowns are removed, and a casting is made. After completion of the casting, the crowns are placed in position, and the casting is trimmed to the point of polishing; after this it is replaced upon the model, the crowns are removed, and the piece is united to the abutments.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

SUGGESTIONS TOWARD THE RATIONAL TREATMENT OF THE VARIOUS FORMS OF PYORRHEA ALVEOLARIS.

By W. STERLING HEWITT, D.D.S., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, at its regular monthly meeting, May 25, 1915.)

IN a recent paper published in the DENTAL COSMOS, April 1915, p. 433, I discussed the "Advisability of the Use of Vaccines in the Treatment of Pyorrhea," noting the strong probability that we were dealing with a group of diseases. I wish to dwell on the most recent development in this line, namely, the discovery of the endamœba buccalis and its specific, emetin hydrochlorid, and to commend the work of the investigators who have made possible the advance toward curing pyorrhea alveolaris.

But, as I confessed to both success and failure in vaccine treatment, so also must I confess to success and failure in the use of emetin hydrochlorid. As in the case of vaccines, we lack the length of time necessary to make any very accurate observations.

The assertions to be made in this paper must therefore be considered as merely hints which remain to be proved, and which may possibly point the way to better knowledge of these conditions.

QUESTION OF THE ACTION OF EMETIN ON OTHER PROTOZOA.

I have no doubt that the endamœba is the cause in a majority of cases of pyorrhea. In a strictly scientific sense, however, the matter has never been absolutely proved, for we have not as yet produced the disease artificially. There is another possibility, viz, that emetin may be a specific for other of the protozoa. The mere presence of an organism in a disease condition is never proof that it is the cause of that condition.

There is a group of cases which I suspect to be caused by the spirochete of Vincent's angina. I have several cases on record where mothers have developed this condition, and it has been followed by an illness in the child, first diagnosed as diphtheria and then as Vincent's angina.

Then there are cases caused by the treponema pallida, and I have also noticed a peculiar condition in the mouths of patients suffering from malaria which would differentiate it from ordinary pyorrhea. What effect emetin has upon these protozoa is a question yet to be determined.

DENTAL CARIES UNFAVORABLE TO THE ENDAMŒBA.

In several essays on the endamœba it has been noted that this organism is not found in the cavity of a carious tooth, nor can it exist in an acid medium. If this is true, we may draw some very valuable conclusions. In cases of pyorrhea where dental caries is absent, it is fair to assume that conditions favorable for the development of the endamœba are present.

In cases where pyorrhea is associated with marked dental caries, the field is evidently poor for this organism. True, the cavities are in the teeth, and the endamœbæ are beneath the gingival margin, and it might be possible for them to exist together. I have found, however, that emetin does not work well in these cases.

THE RÔLES OF SALIVARY AND SERUMAL CALCULUS.

The chemistry of salivary calculus may be another point worthy of consideration. I understand that an acid, such as lactic acid, is required to precipitate

the lime salts and mucin from the saliva. It is a question whether the endamœba can exist in the presence of lactic acid; according to Chiavaro, the endamœba is absent in hard tartar.

When the teeth are comparatively free of salivary calculus, and we find masses of black serumal deposit beneath the gum margin, we may confidently expect to find the endamœba as an active cause.

Another curious result of the fact that the endamœba cannot live in acid media is that it drives the last nail in the coffin of our old excuse—uric acid.

The biological laboratory and laboratory experts are absolutely essential for progress in all branches of the healing sciences, but my endeavor is to adjust matters so that the average practitioner can determine fairly well, without recourse to an elaborate system, what form of gum infection he is dealing with, and how he should treat it.

WRITER'S METHODS OF TREATMENT.

At present, I use the following system, which of course is subject to change:

(1) Gingivitis, inflamed gums with grayish white margins, little or no hard deposit, and sensitive to salt and vinegar, I treat with a 5 per cent. solution of iodin or potassium chlorate and copper sulfate, besides careful cleaning with pumice and orange-wood. I make little or no attempt to get under the gums. These are the conditions in which I suspect Vincent's angina.

(2) In cases where there is little or no deposit either on the teeth or beneath the gum margin, and where pus exudes from the gingiva, I use local applications of 5 per cent. iodin and an autogenous vaccine, with little or no instrumentation.

Concerning vaccines, I would say in parenthesis that I use them mostly for suppurative conditions following the extraction of a third molar and in treating chronic abscesses. For the technique I would refer to the writings of Dr. Joseph Head.

(3) In cases where there is a very heavy deposit of salivary calculus on the free surfaces of the teeth and no deposit beneath the gum margin, the gums being merely pushed back mechanically, I use only careful instrumentation, with sometimes internal administration of sodium bicarbonate. I see the patient at first at frequent intervals, then gradually lengthen the time between visits to six months. In this manner the formation of calculus can usually be checked almost completely.

(4) In cases in which there may be little or no deposits on the free surfaces of the teeth, but heavy black deposits beneath the gingival margin either in isolated scales or in rings, with pus or without pus, I immediately suspect the endamœba.

I use careful instrumentation and injections into the arm of emetin hydrochlorid 0.03 gm. in 1 cc. physiological salt solution once a day for three or four days, as given by Barrett, Smith, Bass and Johns, and to their writings I refer in regard to technique. I do not inject emetin in the gums, for I have found that there is danger of introducing the associated bacteria and infecting the part. I allow the patient to apply the emetin locally, and prescribe a 1 per cent. solution of emetin hydrochlorid in physiological salt solution, advising the patient to put five drops on the wet toothbrush and apply. This will prevent reinfection and is much better than the alkaloidal form emetol, as used in proprietary preparations, for emetin hydrochlorid is an acid.

In one case I followed the use of emetin by a vaccine, but usually the flow of pus can be controlled by local measures, or in the case of an isolated tooth by extraction.

I find that the presence of a partial vulcanite plate is fatal to obtaining permanent results.

There are two groups of cases for which I have not as yet discovered a specific treatment. One is where pyorrhea is associated with rapid caries, and the other where there is rapid or slow recession of the gum without the formation of pockets, and, as a rule, erosion is present.

As supplemental to this incomplete

and tentative classification and the treatment indicated for the different groups of gum infections, I trust that, with the help of every practitioner's observations and experiences, we may arrive at scientific methods of successful treatment of all cases of gum infections.

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[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE RELATION OF THE VITALITY OF THE PERIAPICAL CEMENTUM AND ADJACENT TISSUES TO THE PATIENT'S HEALTH AND THE STATUS OF THE DENTAL PROFESSION.

By CLARENCE J. GRIEVES, D.D.S., Baltimore, Md.

(Read before the Dental Society of the State of New York, at its annual meeting, Rochester, May 13, 1915.)

IT has been said that there are certain events and conditions occurring in life which are so serious that they should never be taken seriously. Whatever the other application of this remark, we are assured it cannot be applied, except in the last resort, to the great equation of health, either of the individual or of the community; nor to the attitude of those kindred specialists whose duty it is to stand guard and care for the communal health—in which the dental profession should hold no second place. We are equally certain that it is only by continued neglect, on the part of the specialist and the individual, of well-known axioms leading to health and of prophylaxis in the broadest application of the term, particularly as applied to the mouth, that the patient may indeed approach the state of the fatalist and become so seriously ill that the only recourse left him is not to take it too seriously.

It might well be added that every new discovery of a health law reduces this list of unfortunates just in proportion as its truths are established to the satisfaction of all the specialists concerned and as it is impressed upon and appreciated by the public. That many such states still come within this category is unfortunately too true; such, for instance, as chronic invalidism, permanent deformity of joint and muscle, incurable anemias with defects in blood and vessels, damage to eyes, heart, liver, spleen, kidney, and nervous system seemingly beyond the realm of body processes of repair, and a host of minor ills the cure of which is well-nigh impossible to our most skilful internists unless discovered at the onset. That many of these diseases may arise through the migration of septic emboli from neglected small focal infective areas in other parts of the body, as well as about the roots of teeth which have been cared for by the dentist, has, we hope and believe, been so amply established as to need only constant repetition so that all may hear, and that this comparatively recent great

pathological truth may sink deeply into the conscience of every dental practitioner. Indeed, enough has been said of causes; the case has been proven, and it is most important that the same attention be immediately directed to the more difficult matter of improving diagnosis, remedies, and procedure.

RADICALISM IN REMOVING FOCI OF INFECTION.

Students of internal medicine were quick to grasp these facts in the developmental diagnostic era, then just awakening to the danger of any portal for septic entry, and many of us felt that the internist was too hasty and a bit radical in his condemnation, particularly of teeth which had received some of our best operative efforts; but after several years as a consultant, with an increasing certainty that many sound teeth were and are daily being destroyed because the dentist is not consulted, the writer is also of the opinion that, after these consultations are requested, many defective teeth are retained because of the dentist's advice. The internist complains that the dentist is not sufficiently radical—a complaint which later, under the survey of the apical areas by competent up-to-date bacteriologists and pathologists, is established, and shows these teeth to be infected. That these specialists had opportunity to make tests on such teeth forcibly emphasizes the fact that they were extracted in spite of the dentist's advice. Herein lies the difficulty of the present situation, a situation in which the profession should have the help of every scientist in its ranks; it may be best illustrated by any case where the patient is ill enough to enter any hospital or consult a diagnostician, and the usual radiographic study is made of the apices about all teeth bearing fillings, crowns, or bridges from which pulps supposedly have been removed and the roots of which have been filled. The question immediately arises, if rarefied bone areas appear about all such teeth, many of which are comfortable and show no apparent clinical defect, which will the consulting dentist condemn? The answer, in the writer's experience, is that no distinction can be drawn, that with the little we know of the matter, *all must be condemned*—that any and every tooth so involved might be the focal area producing the systemic state; and who can or is willing to assume the responsibility of saying, from any means now at our command, which is periapically infected and which is not? For if we leave one dental area, all other body focal areas are blotted out in vain, and the disease progresses. We are perfectly certain that many of these teeth are as nearly functional as the best thought and technique in our profession can make them; every rarefied bone area is not necessarily an infected area; yet these are often the pulpless offenders which will show virulent cultures.

CAUTION IN REDUCING MASTICATORY EFFICIENCY.

By what means can our diagnostic methods, our medication and surgery, be so improved as to save not only these teeth and the patient's health, but our reputation, and assure the standing of our profession? That is the question. It is also quite evident that, in all matters of health, the medical practitioner is absolute, as he should be. He can obviously take no chances. If the condition be suspected as infectious, every portal of entry must be obliterated, for he is responsible for the patient's health. If we knew more of this matter than he, and presumably we should, as it is our matter, we should instruct him, as indeed some have tried—when it has been always found that there are few of his class who were not willing to learn, if convinced of the ability of the teacher. If we are not satisfied with this state of affairs and the internist's decision reached in a case, after he has carefully weighed the evidence based on reports of all specialists as to focal areas, let us appeal from his decision and retain the tooth, but also let us remember that we must sign the death certificate, even if the patient lingers around and finally

dies with all of his teeth. There have been many instances where by order of the internist all the teeth have been extracted, presumably by some dentist. Barring unusual oral sepsis and pyorrhea, the writer could conceive of few such cases, and would protest against this procedure, for more than once it has plunged the patient into a serious gastro-intestinal disturbance, and it reduces mastication, hence indirectly nutrition, by nearly 70 per cent. It has also been remarked that the medical man would not so glibly have disposed of his patient's teeth, had he not known how perfectly artificial substitutes had been developed by the dental profession, and that it was possible at least to maintain some sort of mastication. Another question is often asked, *i.e.* would he as lightly request the surgeon to amputate the fingers, which are only indirectly concerned in nutrition, to the tune of 70 per cent., when he is aware that the artificial substitute could never become 30 per cent. efficient, as artificial teeth are said to be? The writer believes he would be justified in both decisions if the exigency of the case made for the ultimate health of the patient; for in the treatment of infection, as in the treatment of morals, the biblical rule holds, "If thine eye offend thee, pluck it out," and the health of the whole body is the health of its component parts.

ANALOGY OF TONSILLECTOMY.

Let us consider for a moment the tonsils, which rightly came in early for their share of condemnation, being the first organs to be suspected as portals of septic entry, and which still stand condemned along with the teeth as among the most noxious. In the first phase of the situation, tonsillectomy was even more generally and radically practiced than tooth extraction is today; later the question as to just how important a factor the tonsils are in human efficiency was and still is discussed, just as the teeth are now subject to survey; a greater physiologic and histo-pathologic knowledge was thus had of these organs, and other than the severe operative measures are now applied up to the point of the failure of the cells to win the fight against bacterial invasion. When the local fight is lost and resistance lowered, there is always systemic disturbance, and when the organ can no longer function it should come out, just as a tooth under like conditions.

Tonsillectomy in the meantime is being greatly improved, and the earlier operation, which frequently left the lymph areas more open to microbic invasion than before, with serious sequelæ if not death, is no longer done; in many respects this situation resembles the early efforts and some of the recent attempts at pulp conservation by mummification, only with the decided difference that the dentist was endeavoring to save a tissue, the laryngologist to destroy one.

LARYNGOLOGIST VS. DENTIST.

The attitude of the laryngologist all through this criticism of his work has been particularly fine; it has so many features analogous to our present condition that are well worth emulation by the dental profession as to be a most important lesson. He has gradually convinced the general practitioner that this operation, formerly considered, like dental operations, of small moment and anybody's business, can only be correctly done by one trained in his specialty. He has more carefully reviewed his operative field, as *we* should, thereby conserving much neighborhood tissue; on the other hand, he has produced an operation which eradicates every portion of tissue which might be a medium for pathogenic adaptation; he has offered willing co-operation to the internist in repeated attempts to clear up everything in his province—*which we dentists have not done.* He has not been an obstructionist, nor oversensitive to criticism, as we have, just because he operated on a sinus or a throat without general recovery of the patient from some faraway symptom; he did not resent the return of the patient by the internist for another search for some other hidden

area in his field. Much of this is quite the reverse from our behavior, which has too often been indefensible. Just because we treated a mouth or a tooth—presumably to the best of our ability, and with only that promise to the patient—if, months or years later, systemic symptoms arise and the internist requests us to review our work, we too often take it personally, rather resent the imputation, and believe that it reflects on our profession. Now, no better plan could be conceived for convincing both the patient and the medical man that something was, after all, really wrong. Something was and still is wrong, and it may or may not be our fault; we presumably have done the best we could in the past, but it will be very decidedly our fault in the very near future, indeed right now, if we do not proceed like the laryngologist to review our histo-pathology and reform our diagnostic and operative procedures.

An important step in the solution of this problem is to be found in a more intimate relation of the dentist to the internist—such association as is common to all specialists with internists in the hospital, where all are convinced of the honesty of the co-operation and where nothing but the truth is acceptable, and motives are not questioned.

WANTED: A SENSE OF HISTO-PATHOLOGY.

Leaving the question of microbic invasion by way of the gingiva, known under the too broad term of pyorrhea alveolaris, to abler hands, the writer attempts again, in this his sixth paper, to center attention on the periapical tissues, because he believes a correct understanding of the histo-pathology of this area to be even more important than technique, again because it will obviously determine future diagnosis and exact technique. The revered Dr. Truman's "Wanted: A Sense of Pathology," as applied to us, went true to the mark. The writer would presume to add, "Wanted: A Sense of Histo-pathology," so that we may relate and correlate these tissues in the normal well enough not to damage them in our attempt to relieve abnormal processes. So, while the title of this paper may seem a far cry, from the health of the dental periapical and adjacent tissues to the health of the patient and the status of the profession, they are all so intimately involved that our profession—and we say this in all seriousness—will gradually cease to be a profession if we do not proceed at once to meet and master this question of periapical infection. It has been rather facetiously remarked that the way to prevent periapical infection is never to have it—to practice such perfect mouth hygiene and prophylaxis as never to allow carious invasion of enamel, let alone of dentin and pulp, with consequent necessary pulp extirpation. While our sympathies are with this ideal, cleanliness has not eradicated dental caries as yet, and all we can hope is that it will be about as efficacious in the mouth as the application of the same principle in other microbic diseases. Nor has the dental millennium arrived as yet; in the meantime an occasional pulp becomes infected and exposed. So it is to the normal apical region that we would call your attention.

As far as our present knowledge goes, if there can be differing degrees of relative importance of the six cardinal dental tissues, it lies with those attaching the teeth, *i.e.* the cementum, pericementum and alveolar walls, rather than with the pulp, dentin, or enamel, for it is possible to remove a pulp and leave dentin and enamel in physiologic relation to the jaws, if the nutrition of these attaching tissues has not been attacked in the effort, while lesions arising at the gingiva, such as interstitial gingivitis, are most fatal to all tooth structure and the least under control of all mouth diseases.

CEMENTUM AND PERICEMENTUM.

The following description of the cementum and fibers of the pericementum is paraphrased from many histologists, principally F. B. Noyes ("Dental Histology and Embryology," 1913): Ce-

mentum and pericementum attaching the tooth to the alveolar walls are developed and formed according to age and particularly use; as the tooth erupts, there is but one layer of cementum, *i.e.* the primary circumferential lamellæ, laid down against Tomes' granular layer at the expense of the thickness of the future pericementum. This layer contains microscopic fibers, but is otherwise an apparently homogeneous calcified structure, so there can be no known communication from the pulp via the dentinal tubules and the lacunæ and canaliculi to the peridental membrane in the dentin region. Lamina after lamina is added; these are deposited among the fibers of the pericementum attaching the same (by the way, the only means by which they can be attached) by a modified connective tissue cell, the cementoblast, which presides over this deposition and finally becomes inclosed in matrix substance, producing the lacunæ, with their processes, the canaliculi. Of these there are not so many as in subperiosteal bone formation, but the whole procedure is very like it, as Hopewell-Smith ("Pathology and Patho-histology of the Mouth and Teeth") observes, minus the number of penetrating vessels. "The cementum becomes gradually thicker in the middle third and is thickest in the apical third," so that the apex of every adult tooth is completed in vital and growing cementum containing many lacunæ and canaliculi, if not vessels—a much more open structure, free to the flow of tissue juices, than that covering the remainder of the root. Noyes says, "From a study of the lamellæ, therefore, it is apparent that the entire root is clothed with successive layers, and that these layers are formed intermittently, but continue to be formed as long as the tooth is in position" And again, "This occurs whether it contains a live pulp or not." "If for any reason the tissues are detached from the surface of the root, they can only be reattached by the formation of a new layer of cementum on the surface of the root, which will embed the surrounding connective tissue fibers." "In order to accomplish this, the tissues must lie in physiologic contact with the surface of the root, and the connective tissue cells must be actively functional." "In view of its function, therefore, the cementum becomes not the least but the most important of the dental tissues." Age and use control the formation and thickness of the lamellæ, and in a general way the number of layers is an index to age. "If a considerable number of teeth of persons of twenty years were sectioned, the lamellæ counted and the number compared with the number found in teeth extracted from persons of forty, a fairly regular increase in numbers of layers will be noticed and so on for fifty, sixty, seventy, or eighty years." "It is important to remember in connection with this formation of cementum, that teeth move more or less under the influence of natural forces throughout life, and that every slight change in position must be accomplished by the formation of a new layer of cementum to reattach connective tissue fibers in new positions or adjust these to new directions of stress." "Again, it should be noted that wherever special stress is exerted upon a bundle of fibers, the cementum is thick around them." "There is thus continual resorption and repair through life to meet stress and new layers are being constantly added."

THE BLOOD AND LYMPH SUPPLY OF THE TEETH.

The nutrient pulp vessels and their mode of entrance into the tooth is also most important in this connection, it would appear that we have been very decidedly misled by anatomists, both in descriptions and illustrations of the vascular supply of this area. This has been ably corrected by J. Bethune Stein ("A Study of the Maxillæ with Regard to Their Blood and Lymph Supply," *Items of Interest,* September 1908 to March 1909) and I. N. Broomell ("The Genesis of the Blood Supply to the Teeth"—*Items of Interest,* April 1908). Broomell takes up the question from the embryological side, and I

would paraphrase his paper as follows: He proves that the theory and illustrations of Constant, so frequently used in text-books, are faulty, saying, "The blood supply to growing teeth, as well as to those fully developed *is not by a single separate arterial twig from the main artery.*" His dissections fail to establish "Constant's idea that the dental papilla, finally the dental pulp, is at any time supplied by the single vessel direct from the artery." Quite the contrary, they show it "coming from above by many minute vessels which arise in the peridental tissue and find their way into the pulp after coming through the wall of the dental follicle." Here it is to be noted and accented that the cementum is formed from the follicular wall as is the pericementum; hence it is significant that the vessels pass through it. This will account for the facts developed in the study of root-apices undertaken some time ago by the writer, in which it was established that, while one vessel was larger than the others, there were many found coursing their way through the apical cementum; in many instances they entered at the beginning of the first deposit of cementum and passed down toward the apex at any place from 40 to 90 degrees to the long axis of the tooth, turning into the main canal to follow the lines of a fish-hook, and that some of these vessels are closed by subsequent additions of cementum to the root apex (J. B. Stein, *Items of Interest*, September 1908 to March 1909); but instead of 10 per cent. of apices having this arrangement, as was commonly believed, more nearly 25 per cent. have more than one nutrient vessel which persists, and finally, this whole region is much more vascular and open than we had suspected. These conditions are further proven by the turn at any place from 45 to 90 degrees found in the immediate apex of so many multi-rooted teeth, and we must recall again to our minds that this is all vital cementum and is really built about the vessels. The writer has yet to see radiographs of sufficient accuracy to show these multiple vessel openings, and there are but few which definitely mark the final flexure of the roots. This is to be regretted, but better representation is hardly to be expected, for radiographs at best portray poorly two dimensions, while here we are considering three.

DAMAGE INFLICTED UPON CEMENTUM AND PERICEMENTUM BY OVER-MEDICATION.

In the foregoing description several immensely practical truths are thrust at us having a direct bearing on our treatment of this field. Paramount among these stands the fact of the vitality of the cementum; that the cemental apex where we finish every root-canal operation is not built, in the adult, of lifeless dentin after pulp removal, but if properly treated can be and is left a vital tissue, not unlike subperiosteal bone, with a nutrient circulation on one side at least—a tissue with remarkable powers of repair, which will respond in degree to the demand made upon it. Do we fully realize what this means? From working so long on what might be called the "helpless" tissues—viz, the enamel with no reparative power; the pulp, which if repaired at all, is almost invariably exhausted by the attempt, ending in calcific or some other form or degeneration; and the dentin, of low reparative effort—we have come to believe in and to practice extirpation and devitalization, and then preservation by the saturation of these tissues with strong sterilizing agents, which are too often destructive not only of the tissue but also of its reparative powers. It would appear that we are thoroughly obsessed with this idea of generally preserving things. Here are two tissues, cementum and pericementum, that nature can and will repair if we only give her a fighting chance and do not permanently devitalize and infect them and do violence to nutritive processes in our effort to preserve them. We do not believe that the great natural advantages of these tissues have entered deeply into the consciousness of many dentists, nor into their operative plans, but they have

nevertheless been biologic factors, active to our advantage, despite abuse, whether we recognize them or not. That the various medicaments and methods as applied to the extirpation and removal of the dental pulp always endanger the periapical area we are assured. That they frequently penetrate more deeply than we realize and produce a minute periapical necrosis of the neighboring bone, denuding the cementum of the peridental fibers, we are also certain; and this often occurs with little pain or response from the tooth, and must not be misunderstood as referring to the gingival necrosis from careless use of arsenic, for it often results from the most careful applications.

Dr. Weston A. Price is engaged in an intensive study of the damage to the attaching tissues of the tooth resulting from too strong medication, and what he has reported to date more than confirms the writer's views heretofore published, that all pulp and canal medication has been too high in oxidizing, destructive, and penetrating power, and the most dangerous of all these is that foe of all connective tissue, arsenic.

Attention has been called to the general vascularity of this region; to the multiple foramina which no operator in approaching a pulp for devitalization can foresee, and which no primary radiograph can foretell.

THE UNTOWARD ACTION OF ARSENIC.

Attention is now called to another anatomical fact which has been neglected, and to which we will refer again, *i.e.* that this union of tooth root to the alveolar walls is a true joint, not in the sense of a full arthrosis, yet allowing a certain amount of motion and sway normal to every tooth, and especially is it a joint in the interposition of a fibrous membrane between bone and cementum, with a vascular embryonal connective tissue, the dental pulp, leading into it. What would we think of an orthopedist who placed arsenic or any other penetrating and oxidizing agent, such as strong formalin, into such a circulation, leading down into a joint, for a few days, and proceeded to forget it? If he had no means of knowing the relative vascularity of the tissue, would he be surprised to find the neighboring bone and membrane destroyed? Yet that has been the attitude of the dentist. The favorite idea of thrombi arising in pulp vessels, preventing arsenical entrance into the general circulation, cannot be fully accepted, for these thrombi are apt to be arsenically supersaturated and in turn affect the other tissue, until the local cells control the invasion or become necrotic in the effort. This is all a matter of absorption and vascularity. The writer has seen, in the past, arsenical salve applied *ad libitum* to chronic old leg ulcers with no ill effect, while minute application in a normally exudating wound on the same leg would play havoc. The type of gangrenous pulp corresponding to the chronic ulcer is just the type which arsenic will rarely devitalize, as every operator knows; while in the other vascular type it is efficacious, and by the same token is much more dangerous.

From the study of an increasing library of radiographs, the histories of which are known, we are convinced that there is a greater proportion showing rarefied apical areas, particularly about good canal fillings, produced in this way by arsenic—often before the filling is placed—then those resulting from liquefaction from after-infection. The significant feature is that this is a true chemical tissue necrosis, which is sometimes subject to primary direct infection by the operator or post-operative infection from neglected septic foramina, sometimes by secondary, endogenous infection via the blood stream. But just as often it persists as a bone cavity, occupied by fibrous granulations, and is never infected. Attention will again be directed to these areas, which often mislead into interpretations of areas as infected which are not supported by careful exploratory incisions and the resulting negative culture; but who, from the clinical evidence and radiographs, can decide this matter?

ARTIFICIAL PRODUCTION OF APICAL NECROSIS BY ROOT-CANAL DRUGGING.

The continued application of strong formaldehyd preparations, phenol, cresol, trichloracetic acid, zinc chlorid, and a host of germicidal oxidizing agents in too high percentage, placed too high in the root; the pumping into this space of sodium and potassium, which is most efficient in destroying the organic tissues; the intentional perforation of this area and passage of nascent elements, such as chlorin from ionization of sodium chlorid with a zinc point in the canal—all will, more or less, according to application, produce tissue necrosis, often without infection of this area but with liquefaction of bone and the apical pericemental fibers, denudation of the apical cementum, and necrosis of the apex. The latest thought and practice in surgery, going hand-in-hand with the modern aseptic rather than the older antiseptic operation, and second only to asepsis in importance, is that as few cells be destroyed as possible. The surgeon has a growing regard for every bit of tissue, for he knows that every cell made necrotic is but another nidus where infection may lodge and find just the needed media for sporulation. Even if uninfected, this cell necrosis is an added element and burden of which the phagocytes and reparative processes have to dispose. Billings (in discussing Best's paper on "Pulp Devitalization," *Dental Review,* April 1915) has recently made quite clear the two great factors active in the body diffusion of the products of focal infective areas; they are—First, lowered local resistance in a trauma or crypt adjacent to lymphoid spaces or tissue; the entry of pathogenic organisms; the death of the tissues furnishing not only nutrient media, but, according to the oxygen which is supplied thereby, opportunity for microbic adaptation in these atria. Second, the septic emboli resulting therefrom, finally appearing elsewhere in the body and producing the disease conditions mentioned. A very long time may elapse after blotting out every focal nidus, before, with every known means, the general resistance may be raised to the point of disposing of the products of such general infection.

THREE CHIEF DANGERS OF ROOT-CANAL TREATMENT.

So the three great dangers to the dentist in operating on this area are quite apparent, *i.e.* first, the production of a minute periapical tissue necrosis of which he is not aware; second, infection of that area, which has lost its resistance by his processes; or third, if he succeeds in closing it without infection, the final arrival, by hematogenous convoy, of micro-organisms, often of the non-virulent type, which may lodge thereon, become adapted and raised in virulence, due to the media furnished, and propagate so rapidly as to form a really dangerous infective nidus. In the writer's opinion, at least one-third of the blind periapical abscesses following not only ordinary, but some of the most perfect root-canal work, have thus arisen, and they are even more dangerous than the primary infections, because the patient's general resistance must be much lowered to permit this type of endogenous infection; and again, these are types where all medication and treatment accomplish little.

SHORTCOMINGS IN PROCEDURES OF PULP DEVITALIZATION.

The operation for devitalization of a dental pulp, at its best, is not only surgically unique, but as commonly practiced is also a somewhat questionable surgical procedure. So far as the writer knows, it is the only instance where the surgeon proposes to destroy a tissue and then leave it in the body; for we cut off the nutrition of two tissues, dentin and enamel, by destroying, removing, and substituting in the place of the pulp—the nutrient organ—a root-canal filling, which is a foreign body; meanwhile the periapical area of attaching tissue of the tooth—forming a joint allowing a certain amount of motion—is often disturbed in order to accomplish this, with

decided increase in the tooth sway; then we plan to leave all this destroyed tissue, with its weakened attachment, to the care of the stress of occlusion, and expect of it full function. It is also on such apices that we frequently aim to place fillings, crowns, and bridges in perfect occlusion; is it any wonder that in attempting to accomplish this operation, or to relieve pain, or prevent infection, we carry our technique and medication too far? In attempting to destroy the pulp and restore the tooth, we destroy both. The tooth, with its many inoperable canals, becomes a dangerous culture tube with all the elements necessary for growth and adaptation of micro-organisms, finally ending in alveolar abscess.

A PLEA FOR MORE RATIONAL METHODS OF PULP DEVITALIZATION.

We would at this point make a strong appeal—(1) for the surgical removal of the dental pulp; (2) for the discontinuance of the use of arsenic, except in unusual cases—then to be applied, not to the pulp, but to some sensitive spot in the dentin, for a short time, so that by slow absorption, only the coronal pulp may be affected; (3) that the apical third of all pulps be removed surgically, as far as possible; (4) that the immediate cemental foramina, containing blood-clot, tissue, detritus, and exudate, consequent upon the operation, be allowed to drain in the presence of mild iodin solutions, iodoform, or a weak formalin solution, which have been pumped into the field and carefully sealed there, away from saliva, by temporary cement stopping; (5) that the foraminal contents be finally removed, working in these solutions. This may appear old-fashioned, but in reality it is the most modern bone surgery, and follows the most approved practice in operations for osteomyelitis, which this diseased area and tooth apex resembles. It has been and is our method in handling comparatively open, freely draining mouth wounds easy of repair; why is it not good practice in this area, which is inaccessible, difficult to drain, and slow to repair? Much has been written of the care which should be exercised to remove all the foraminal content and to prevent the introduction of infection in root-canal operations, and we cannot emphasize too strongly these precautions. Callahan, Rhein, Best, Ottolengui, and others should be highly commended for their untiring efforts to improve and standardize this field; no operative effort is too difficult, no period too long, no precaution too minute, which will finally produce an aseptic and mechanically perfect canal operation. Much has also been said of the ways and means to effect a clean operation, and to the mind of the writer there is infinitely more danger of infecting the periapical tissues by forcing through bits of infected dentin, cementum, or shreds of pulp, when the attempt is made to remove immediately every particle of pulp and to seal the apex in the first operation than if we delayed awhile as described in the foregoing, and attempted to sterilize this area before operating. With the rubber dam *in situ* and all instruments sterile —a most necessary precaution—it takes more than five or ten minutes to sterilize any tissue, even if the destructive agents, in strength heretofore mentioned, are used, and we have yet to meet the operator so skilled in pulp diagnosis that he can say from the symptoms how much of the dentin and pulp of any tooth is infected. The safer plan is to proceed as if it were all infected—which we believe it is—and to attempt to control this by applying mild solutions for a prolonged period, before final removal of the ultimate apical tissues; finally, to allow the areas to heal before emplacing the artificial substitute for the pulp. It would appear at least that this is good surgical sense.

DIFFICULTIES OF RESTORING TISSUE HEALTH IN APICAL INFECTION.

We have so far only considered the necrotic apex and adjacent tissue, but when this tissue becomes infected after necrosis, or the necrosis in turn is pro-

duced by alveolar abscess, it is questionable if the tooth, all things considered, will ever really perform full function, or whether, unless surgically treated, which will weaken its attachment, it will not under occlusal stress always remain somewhat of a menace to health. ("The Responsibilities of the Dentist in Systemic Diseases Arising from Dento-alveolar Abscess, etc.," C. J. Grieves, DENTAL COSMOS, May 1914.) "If the fibers of the peridental membrane which penetrate the cementum be liquefied, and if the cemento-genetic or nutritive cell layer be raised for a period from its surfaces, if the dental pulp be suppurating or gangrenous, passing centrally through the periapical cementum on the one side, and if it be exposed to pus containing pyogenic cocci on the other—with its nutrient supply doubly cut off, cemental necrosis and infection may be a matter of but a few hours; for even if the pus be evacuated and the periapical tissues readjust themselves, they are restored in unattached white fibers, and the nutrient vessels are of course never restored. The pathological picture then becomes that of a bone from which the periosteum has been raised on both sides, with no blood supply from the narrow cavity. In bone, such areas rapidly become necrotic and are finally sequestrated, when new bone is formed; not so the pericemental apex, for it is retained by the remainder of the pericemental membrane attaching the tooth, which may finally functionate perfectly, while holding *in situ* a dead cemental apex." Noyes' ("Dental Histology and Embryology") remarks relative to these types are appropriate: "When bone corpuscles are killed or die, the matrix becomes a foreign body, and is either absorbed or cast out as a sequestrum." "The same conditions are true of cementum; for instance, there are many cement corpuscles in the lacunæ in the region of the apex of the root." "If this portion be bathed in pus, the cement corpuscles are killed, and the tissues become saturated with poisonous materials, so that tissue cells cannot lie in contact with it and live." "In order to restore a healthy condition, the necrosed cementum must be removed mechanically until tissue is reached with which cells may lie in physiological contact without injury." Grieves ("Responsibility of the Dentist," etc.): "It is the writer's opinion that the apex thus becomes necrotic in nearly every fistulous and blind dento-alveolar abscess." "This opinion is based on the results of the study of a large number of X-ray films and specimens." "The specimens in section confirm the fact of the death of the pericemental tissue, and there are many in which the abscess sac, so called, does not involve the visible canal opening, but arises off some point below it, particularly in those specimens where it is difficult to locate the entry of the apical vessels." "This opinion is further confirmed in the radiographic films by a few cases of well-treated alveolar abscess resulting in apparently perfectly functioning dental organs which show no reconstruction of periapical bone, the space formerly occupied by the abscess being filled with organized fibrous tissue." "This is the greatest argument against the vitality of the apex." "Resorbed bone areas remaining uncalcified always indicate an irritant or necrobiosis; they are not nature's method of repair elsewhere in the body; why should they be so considered in the alveolus?"

To quote Noyes again ("Dental Histology and Embryology"): "It should always be remembered that the treatment of an abscess is a biological problem, not a matter of drugs, except as they are a means of producing cellular reaction." "That the tissues may be reattached to the surface of a root is both theoretically possible and clinically demonstrable, but for it to occur, biological laws must be observed, and the conditions are very difficult to control with the old method, involving excessive use of strong antiseptics." "It is well to remember that the dentist can never cure a suppurative pocket alongside of a tooth-root, but if the condition can be

controlled, the cells of the tissue may form a new layer of cementum reattaching the tissue, and so close the pocket."

ROUTINE CONTROL OF DEVITALIZED TEETH.

Considering our limited knowledge of just how the tissues are adjusted after periapical infection, and of how little any known treatment accomplishes, and with a desire for research in this particular field only equaled by a dread of the consequences to the patient if the operator fails in his full duty, the writer believes that the only honest and safe procedure, if teeth which have abscessed are to be retained at all, is the occasional radiographic study of the field, long after the operation, with the full understanding on the part of the patient that any such tooth is a very doubtful tooth. If it should "go lame" or "feel long" for even a short period, particularly before use in the morning, or become sensitive to heat or pressure from any direction; if the alveolar walls over the apices respond in the least to pressure; if it lacks the normal bone ring in percussion—it should be opened, or the periapical tissues should be explored by way of the alveolus, and an attempt made at cultures. Even if these prove negative, if there are systemic symptoms, after having considered well all the probabilities, we should order extraction of the tooth. This statement no doubt will be challenged by those who claim that they can fill every tooth apex and who honestly believe that the perfect root-canal filling is a "cure-all" for these conditions—and the writer would insist that he stands second to none of those who have attempted, by every means at their command, to improve this, the absolutely most important operation which we perform.

BOASTS AND PASTES DANGEROUS FACTORS IN ROOT-CANAL FILLING.

The fact that many root-canals cannot be filled, he would not use as an excuse for failure. These boastful claims that every apex can be sealed are identical with the gradual and harmful transition of the excellent rule "Every tooth possible must be saved" into the dangerous practice "Every tooth can be saved," or the misleading hygienic slogan "A clean tooth never decays," when, as far as the word "clean" has been defined, no tooth is ever really clean. These sweeping generalizations do our profession much harm. No condemnation is too great for those who take advantage of the known fact that certain remedies, nostrums, and pastes, "perpetual disinfectants," erroneously so called, can be placed in the stump of the necrotic pulp, carelessly left in the apical root-third, and may make the patient comfortable for a year or more. This is a most contemptible expedient of the inefficient, and sometimes the efficient but unscrupulous operator who gambles with his patient's immunity. Granting no systemic after-result, the apex becomes an ideal culture tube at body temperature, connected with lymph spaces for daily inoculation, and the tooth is surely doomed. Further, these pastes, which can be pumped anywhere, often contain metallic oxids, which appear in a radiograph like a metal; they rarely set like a cement, hence are not fillings, and are apt to mislead the most skilled diagnostician in reading the radiograph. But the finest root-canal filling can never alone save a tooth apex; it is a very important factor, but only one of the many contributing to a successful operation; for unless the periapical tissues damaged by the lesion, or the dentist's processes in treating it, be resorbed, and the fibers of the pericementum be reattached—in short, the whole area be repaired—mere technique will never produce a healthy tooth. This brings up the whole question of the filling of root-canals, and, since Dr. Callahan has said that there are one hundred and fifty-odd methods now in vogue, the writer does not propose to add another to this list, but would like to propound a question. Where do you terminate your root-canal

filling—*at, just to, in,* or *through* the immediate vessel opening?

THE PROBLEM OF COMPLETE PULP EXTIRPATION.

This is said to be a dangerous subject, and what is here introduced must not be misconstrued as an excuse for slovenly methods. That every particle of pulp which it is possible to remove by the finest instrumentation and technique and with no regard for the time consumed, should be removed goes without saying; we are also convinced that the operation should be painful if the apex be vital, and the filling should end *to* and *in,* but *never through* the apex, with certain exceptions to be noted later. The rather recent, and what might be termed too officious, surgical procedure in this area is to be deplored—we refer to the practice of intentional perforation, under the broach manipulation, with sodium and potassium—for the simple reason that it is not possible, even with a help of a radiograph, in the majority of adults, to look into a canal and to follow all its ramifications to the ultimate, and then on out intelligently into the pericementum, though it is easily done in the open canals of childhood and adolescence (though not so easily repaired), for the age and development of the patient is here, as elsewhere, of primary importance, and we recall to mind Noyes' remarks quoted as to the normal added cemental lamina as age advances. Some sort of a perforation can always surely be made, a gold wire passed, and radiographs taken—but is this the real vessel opening? Have we not added another chance for damage and infection of the surrounding tissues, and after all left the old one still containing a part of the pulp? And if we succeed in filling this new one, how are we going to fill the original opening we could not find? If there are other vessel openings at angles to the main canal, how are we going to excavate and fill any of these, when we cannot determine their presence by radiograph or sense of touch? Again, what is the idea in perforation, anyway? Presumably, that every particle of pulp tissue be removed. The writer sympathizes with this commendable view, which has been one of the desires of his professional career, and which he is bound to finally accomplish, but there are an increasing number of cases in those studied, where the necropsy will show that all but the smallest apical part has been removed, and of the two evils we should rather stop at that, if the apex can only be left vital; if it be necrotic, apicoectomy, or surgery, will eventually be the only means to accomplish that end. Hence, when it comes to a question of deliberate puncture that all vital pulp be removed, it were better to consume the time in conservation, and to stop just short of it—to remove the pulp *to,* but not *through* the apex, and particularly not to run the risk of infecting this area—and then to allow the cells to resorb and care for the vessels and small tissues left. For, after all, these natural processes are the only means which will care for the damage in the perforation we make, anyway, and this whole region is finally repaired by cell processes and not by our processes. Our duty is but to remove, not destroy; then, following the recent surgical rule, there will be less cell necrosis, less tissue to repair, than in the method of deliberate perforation. Repair in this region depends, as we are again reminded by the quotation from Noyes, upon the fact that the cells must reach and resorb the defective area and lie in physiologic contact with it. A new attachment of tissue can be produced in no other way; this is quite possible concerning the organized clot and pulp shreds mentioned as lying just at the immediate foraminal opening, but this condition must be sharply differentiated from tangible pulp shreds negligently left deep in the apical third. Even if the pulp be all removed, the failure of the filling to reach the immediate foraminal opening will create a tube dangerously full of exudate—all of these conditions existing far away from any chance of physiologic cell function or normal contact.

CRITICISM OF THE METHOD OF ALLOWING GUTTA-PERCHA POINTS TO PROTRUDE BEYOND THE APEX.

The also rather recent process of protruding pink gutta-percha cones, which have been sterilized and softened in chloroform, through these intentional perforations, we do not believe to be necessary, nor will it eventually stand criticism as good bone surgery, for the following reasons: First, we are invading a joint, as has been shown, allowing sway of the tooth, proportionate to the destruction of the peridental fibers; this motion, present in the normal teeth, is greater in teeth where the periapical foundation has been destroyed to any degree, and these are the cases needing most this operation. Some operators claim to protrude the filling in all cases, others only when there exist resorbed bone areas. It has been observed where there is much backward pressure from healthy tissue, that the soft chloropercha assumes "mushroom shape" on the apex, or is "encapsulated" at the end of the root. If there exist a periapical pocket or rarefied area, it will push on to the outer wall, wherever that may be, of the area, and double up in "pig-tail shape." The point we desire to make quite clear is that these extensions all move as the tooth sways in mastication, and while there exist radiographs showing bone apparently built up near the projecting filling, closer inspection will disclose enough open area about the gutta-percha to condemn adjacent apices which have not been so filled in the same mouth. Second the writer has opened into such areas which apparently on the best of radiographic evidence were filled with secondary bone, only to find no bone, but a mass of fibrous new granulations. A rarefied area about an apex may mean many things, complete liquefaction of bone matrix under repair, for instance, which should not be disturbed; there are many dense areas where the bone is quite necrotic, just as calcifying tissue may appear as bone; or again, the interstitial bone may be completely riddled with little granulations showing on the film. Thus, radiographic testimony is only of value where the picture is repeated at the same angle. Quite unintentionally, large areas may be masked by changing the relation of the tube to the incidence of the root. It would be interesting if those claiming new bone could make a few harmless exploratory incisions and take cultures in these regions. Third, it has been said that bone will always build about such sterile gutta-percha fillings, and this, together with the assurance of a well-filled root, is the reason given for making such fillings. There is radiographic proof that such is the case, if the foreign body is at rest, but never when the body is moving, as a tooth. There are many films showing bits of root, gold, amalgam, gutta-percha, etc., perfectly encysted, but all of these were not involved in occlusion, nor did the roots project into the mouth. Bullets, pins, needles, fish-hooks, etc., are often lost in and cared for by the tissue. Metal plates and wires are embedded in bone surgery, with good results, but the parts are invariably kept at rest. The opinion of the laryngologist on the advisability of such gutta-percha protrusions, which might approach and finally, owing to resorption, perforate the antral floor in the upper molar and bicuspid regions, might also be of interest.

This paper is an argument for the preservation and not the destruction of the periapical tissues. It is hoped that operators will not universally adopt this method, when they would not permit the slightest protrusion of the same pink gutta-percha into the gingiva. The general practice of this method will just as surely produce areas of lowered local resistance, open to any infection, as will the diseased root-apex which it was aimed to relieve. Why not allow the giant cells, leucocytes, and phagocytes, and all the tissues presiding over repair, to attack tissue which, even if infected, it is their province to resorb and rebuild, instead of introducing a moving foreign body? The perforation of this region with a projecting filling is only permissible, we believe, in chronic alveolar

abscess, to be followed immediately by curetment; or in cases where an immediate apicoectomy is planned. It is simply inconceivable as routine practice and will reflect on our methods in the minds of all pathologists.

REPARATIVE POWERS OF THE PERIAPICAL CEMENTUM.

In conclusion we would emphasize the reparative powers of the periapical cementum, adjacent bone, and particularly the peridental membrane. Let us once more for emphasis recall Noyes' statement that laminæ are normally added to the apex increasingly throughout life; that when stress occurs, further hyperplasia of cementum may normally occur, and these deposits are just as usual on pulpless as on vital teeth, and this process is in no sense an hypercementosis nor an exostosis, unless exaggerated. The tooth in occlusion which has lost the fibers of the gingival third from pyorrhea is typical; increased and unusual stress, provided infection has not occurred, invariably induces these deposits at the apex, impinging on the entering pulp vessels, causing frequently calcific degeneration, pulp stones and such osteodentinal deposits as to almost close the apical third of the canal. The pulps of abraded teeth are likewise affected, not only at the coronal but the apical portion with cemental hyperplasia at the apex, and it would appear as if hypercementosis was but a pathological exaggeration of nature's reparative effort, and that it is not so easy to distinguish between normal repair and hypercementosis as was formerly believed. After all, these apical cemental deposits occur with such regularity as to be the normal biological procedure for closing and guarding this area against infection, as the patient becomes older and the teeth are subject to greater use and more open to pulp exposure. It would also appear that this might be a supplemental function to the reparative process of the dental pulp supposedly lost to us through civilized food habits and lack of use. In the collection of specimens for the study of the success or failure of root operations, several important factors heretofore noted must be kept in mind; notably age and use, recalling the increasing apical deposits after forty. It might be comparatively easy to do careless operating on this field at that period and yet succeed, because of the closure of the vessels to such fine caliber as to make pulp nutrition a mystery. This fact undoubtedly accounts for successful root-canal operations in abraded and pyorrheal teeth, where the root-canal filling rarely reaches the middle third. The operator boasts of the success of his method and "has never had a failure;" meanwhile the root-apex and the apical third was filled by calcific degeneration and not by him. In fact, if sections of adult teeth be carefully examined, these extra laminæ are almost universal, and are well-defined and easily found; indeed, there is written in the cementum of every tooth, as in the bark of a tree, the record of every period of stress, and even infection, if not virulent, is always marked there by absorption and repair, often invading the dentin. This secondary or adventitious cementum is more open in structure, with a greater number of lacunæ and canaliculi, so it is possible to say, unless the process has been too active, with secondary absorption, just where repair has occurred. This will answer the question naturally arising from the following statement. After collecting and studying specimens for some time, the writer is convinced that the foramina of every pulpless tooth, if not negligently left open or infected, but filled in or almost to the immediate opening, are after all closed and covered by a deposit of fibrous tissue, which later is often converted into extra lamellæ of cementum. The proof of this contention lies in the fact just remarked, that we can readily distinguish between the older and secondary cementum, and that in some instances it completely closes, and is deposited down into all foramina. It is to be thoroughly understood that these are decidedly not hyperplastic deposits nor hypercementosis, as it is commonly known. It is also

quite evident that visible absorption of the cemental apex occurs in many pulpless uninfected teeth; this is proved by specimens where the foramina were known to be impassable, and which were filled and some time afterward presented the root-canal filling apparently projecting. Closer observation, however, develops the fact that the whole cemental zone has been visibly reduced in some instances down to the dentin. These were not pus cases, nor of the rough type of lacunæ cut in the presence of infection. There can be but little doubt that this resorption occurs, in a degree, in every pulpless tooth the apex of which has been carefully treated and filled. It also is to be noted even in some infected apical areas, and, as has been repeatedly stated, if it can be carried to the point where the cementoblasts lie in physiologic contact, the secondary deposits of cementum, described as reattaching the fibers of the peridental membrane, are not uncommon. If the apex be infected or soaked with strong chemicals or arsenic, the attempted resorption of cementum, which is a minute process, is reflected in the surrounding bone, if that has not already been involved, and the periapical bone areas will then appear as gradually enlarging, by a series of radiographs. The growing rarefied bone area is thus the reflection of a vigorous attempt on the part of the local cells to be rid of the irritating cemental apex, and is always a danger signal, bone being more susceptible to resorptive processes than tooth root.

CONCLUSION.

This idea of repair will explain many phenomena lately developed from comparative radiographic study. For instance, in a recent paper (E. D. Best, "Responsibility of the Dentist in the Event of Pulpless Teeth," Proceedings Second District Society, April 1915), Best reports that in a study of 288 pulpless teeth, "The mechanically defective operations which showed rarefied areas were 177" and "The mechanically defective operations which did not show rarefied areas were 41"—or nearly 25 per cent. Hence, if periapical bone resorption means anything—with no attempt to belittle the value of the most thorough root-canal technique, as these facts can never be used as an excuse for carelessness—we can reach no other conclusion but that some process other than the dentist's has taken care of these teeth. Many of them, we believe, contain the remaining stumps of pulps, vitally nourished and still existing, and in others it is possible that these stumps become calcified. It is almost certain that none of these had been virulently infected, and that few had been devitalized with arsenic. It is also quite evident that the vitality existing in the periapical region protected them, even if the dentist did not. What is the percentage of the buccal roots of upper molars, or anterior roots of lower molars, or of delta-foraminal canal openings in all types of teeth, which have been filled to the immediate vessel entrance, and what has in the past taken care of these unfilled roots? The only answer we can now offer is that, barring infection, and often in its presence, these same reparative processes did better than the dentist, and that in just as many other cases they failed utterly, with resultant virulent blind and fistulous abscesses, accompanied occasionally by systemic diseases —so it would be foolhardy to depend upon this chance protection.

The writer presents this paper with a too evident knowledge of its defects; it is but a proclamation of faith, so to speak, announced too early, needing much confirmation by research, which it is hoped can be made. The situation is so serious that every member of a study club should immediately not only begin the collection of radiographic data and clinical histories, particularly of teeth known in regard to age and use, but should study the results of his work in ground and decalcified sections out of the mouth; and while he should look to his failures, he must also see the results in his successful cases. This means the extraction of some functional teeth, but how little that matters when we think

of the numbers which are lost every day that might be saved by research in comparatively few known cases. A few lives and much illness and suffering might also be saved. Such co-operation with a research directed to assemble the data as to histories, cultures, materials, medication, methods and technique might soon enable us to make just one fairly accurate mouth diagnosis.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

WORKING OUT THE DETAILS OF A PREVENTIVE DENTAL CLINIC FOR SCHOOL CHILDREN.*

By Mrs. HUBERT W. HART, Stratford, Conn.

(Read before the Connecticut State Dental Association, at its annual meeting, Hartford, Conn., April 20, 1915.)

ABOUT four years ago, Dr. A. C. Fones and Dr. R. H. W. Strang of Bridgeport undertook the work of interesting the people in the question of mouth hygiene for the children in the public schools.

THE BRIDGEPORT DENTAL CLINIC.

After much hard work and many disappointments to all concerned, the city officials of Bridgeport granted an appropriation of $5000 to start a preventive dental clinic and demonstration of what could be done in this campaign for clean mouths and sound bodies. The appropriation was placed in the hands of the board of health commissioners; they appointed a subcommittee to work out the plans for this clinic, and supervise the work done in the schools. This Dental Committee consists of Dr. A. C. Fones, chairman, Dr. R. H. W. Strang, Dr. T. A. Ganung, Dr. Wm. McLaughlin, and Dr. F. A. Stevens, one of the board of health commissioners.

The amount of time and thought spent on how to make this small amount of money elastic enough to show results has been enormous, but we have convinced the city officials of the great need of this preventive work, and the appropriation made for carrying on the work this coming year is double what we received last year.

Dr. Fones had conducted a class in the fall of 1913-14 for the educating and training of women in this branch of preventive work, but with the small amount of money available, it was not possible to engage the services of sufficient graduates of this course to do the work in the schools. It was therefore decided that two members of the class should be appointed as dental supervisors of the work, under the direction of the Dental Committee, each supervisor to have four assistants.

RECRUITING ORAL HYGIENISTS.

The question now arose as to how we were to secure these assistants, and have them ready to take up the work when the schools opened in September. It was finally planned to have the proposed work explained to the graduating class of the high school, and ask all girls interested in the proposition to call and talk the matter over with some member

* This paper was followed by a number of lantern slides illustrating the work in the Bridgeport schools.

of the Dental Committee. Several girls responded, some bringing friends with them. All wishing to take the course were required to fill out a simple application blank, stating name, address, age, and education. Fifteen applications were received, and the ten most suitable girls were selected to take a short lecture course and be given practical training, for although we only needed eight girls, we wanted to be prepared to have substitutes ready if any of our assistants gave up the work. Two of the applicants were willing to take the course on this understanding, and we have several times been very glad to avail ourselves of their services, not because any of our hygienists have given up the work, but because of slight indispositions at various times. In fact it is interesting to note that each one of our assistants is becoming more fascinated with this work as each month goes by, and looks forward to returning to the various schools to see how the children are progressing since our last visit.

The course of lectures given these assistants had to be simple and brief, for our time was limited, and the weather that of the month of August, and all we could hope to do was to give the girls an intelligent idea of the structures of the teeth with their surrounding tissues, blood supply, etc., working, with the hope that an extended lecture course would be possible for them at a later date.

LECTURE COURSE.

Lectures on the following subjects were given by Dr. R. H. W. Strang, Dr. T. A. Ganung and Dr. Wm. McLaughlin: Anatomy—cells, systems, and the digestive tract; physiology of digestion; dental caries; bacteriology; dental anatomy and histology; inflammation; diseases of the pulp and alveolar abscess; pyorrhea alveolaris; malocclusion.

The lectures were held three nights a week, starting at 8 P.M., the class often assembling at 7.30 P.M. and reviewing the previous lecture with me. In this way many points not thoroughly understood were explained, and the lecturer's time saved for the next subject Written examinations were held on all subjects.

PRACTICAL COURSE.

For the practical course, Dr. Fones gave us the use of a large room in a down-town building, which was centrally located, well lighted, and supplied with running water. Here the class met every afternoon from two to four o'clock, and was instructed by Miss House and myself in the use of the polishers on manikins; when the pupils had become proficient in their manipulation and ready to work on children, we invited the many children playing outside in the street to come in and have their teeth cleaned. Needless to say we had more patients than we could at that time give treatments to.

One of the first patients was a little Jewish boy with a terrible mouth; he was particularly bright, and asked all sorts of questions. He was so much interested in what was being done that, when he heard we needed children for the girls to treat, he immediately began a tour of the neighborhood to get the children to come to us, and when we went to the clinic next day, every chair was filled, and we had to send many home with a promise that they would receive treatment when we reached their school.

The problem of suitable equipment for use in the schools was a difficult one to solve, for the Dental Committee planned that we should go to the schools to the children, and not have them come to us at a centrally located clinic. In regard to this very point, I feel that the success we have met with in having the children come to the chairs so willingly lies in the fact that we go to them, and do not ask them to come outside the school buildings to us. By the children we are taken as part of the school system, and in their young minds is soon formed the idea that the teachers ask nothing of them that is harmful. As we were to move from school to school it was necessary to have portable dental

chairs, so each girl is provided with the following equipment: An S. S. White portable dental chair, a stool—for all pupils are trained to do the work sitting—a small high table with drawer supplied with lock and key, and a lower shelf, dental engine, and the necessary supplies.

EQUIPMENT AND STERILIZATION.

The girls were asked to pay for their instruments, which consist of the following: Porte-polishers, large and small sizes, mouth-mirror, explorer, cheek-distender, sickle scaler, Darby-Perry excavators to be used as scalers, Nos. 17 and 18, bulb syringe, tweezers, and mandrel for rubber cups.

This was done for two reasons, one that the amount of money available was so small, and the other that better care would be taken of the instruments if each girl owned her own. Duplicate sets of instruments have been supplied each girl, as we found this necessary in the method of sterilization adopted. When we took up the question of sterilization, we were confronted with several obstacles; no public school has hot water, and few have gas or electric lights. We are using the following method, and find that it works with perfect satisfaction: All instruments used are washed with a small brush, soap, and running water, then dried on clean gauze and placed in quart jars of denatured alcohol for from twenty to thirty minutes. Paper napkins are used on top of the tables and changed for each new child. The hygienist's hands are thoroughly washed, and the chairs, which are protected with white oilcloth covers, are wiped off. With the idea of perfect sanitation always in mind, we have used glass for all receptacles, and to minimize expense have utilized household articles as far as possible. Alcohol for sterilizing is kept in wide-mouthed, quart fruit-jars; these have the advantage of glass covers. Pumice is kept in glass jars with screw tops; compound tincture of iodin and phénol sodique in ground-glass-stopper bottles. Spools of dental floss are put in glass saltcellars with the floss threaded through the shaker top; cotton pellets are kept in specially designed holders. Small individual saltcellars of glass are used for mixing the pumice and holding the cotton pellets soaked in iodin; larger ones are used for the discarded orange-wood sticks, pellets, and floss. All the above articles can be easily washed and are reasonable in price.

The water for use in the mouth is heated in small aluminum pans on alcohol stoves, using solid alcohol or "canned heat," as there is no danger of fire or explosion from this.

The hygienists are supplied each week with the necessary amount of pumice, cotton pellets, compound tincture of iodin, phénol sodique, ammonia, carbolic acid, vaselin, brush wheels, rubber cups, ivory soap, alcohol (both solid and denatured), dental floss, orange-wood sticks (large and small), paper napkins, examination blanks, record cards, linen tape, and gauze. The latter is bought in quantity, each hygienist being given a specified number of yards, which she cuts into the required size for use.

This enumeration of equipment and materials sounds rather formidable when it is remembered that it must be carried from school to school, but the hygienists have become expert packers; all small articles are put in the table drawers and locked, and a medium-sized wooden soap box will accommodate all the surplus bottles, pans, etc., so that everything can be handled easily and quickly.

PROCEDURE OF HYGIENE TREATMENTS IN PUBLIC SCHOOLS.

When we were ready to enter the schools, each supervisor being given an equal number of hygienists, Dr. Fones and the supervisor who had charge of the work in that particular school called on the principal usually two days ahead, asked permission to begin the work at a stated time, and discussed with each of them the object of the work, trying to gain their interest and co-operation.

We always asked them to locate us in the place most convenient for them, requesting only good light, and in as close proximity to running water as possible. The following are some of the locations where we place our equipment: Basements, if they are light and dry, deep landings, allowing ample room for the children to march by, tutors' rooms, teachers' retiring rooms, a corner of an unused schoolroom, cloak rooms, wide corridors, and last but not least, the principals' offices, for on my list I have two principals who give up their offices to us and have their desks moved to the corridor, which is not light enough for us to work in. The co-operation we have met with has been splendid; for instance, one principal is always anxious that every child in the first grade of her school shall have his or her teeth cleaned and polished. This is what happened on a first visit:

A little boy had been placed in the first room on the opening of school in September; he was most anxious to learn to read, and his greatest ambition was to read out of a book. Reading words off the blackboard did not satisfy him, and he was always asking to be put in the next room, where books were used. Finally the principal heard of his ambition and decided to grant him his desire, and I do not think there was a happier boy in that school. But a week or so after his advancement, the dental hygienists arrived at the school and the cleaning and polishing began. When this boy was sent to us he came most willingly, but when he reached the cloak room where we were working, one glance at the equipment was enough for him—he gave one unearthly yell and began to cry his loudest. Teachers and principal came, but he could not be persuaded to sit in the chair, so the principal took him downstairs to room No. 1, with instructions that he was to remain there without his beloved book until he had his teeth cleaned. By afternoon he could stand it no longer, asked to come and have his teeth cleaned, had his treatment without a whimper, was put again into room No. 2 with his book, and we have had no trouble since with him.

TEACHERS' CO-OPERATION.

Other principals are as interested in having all the children brush their teeth every day; the principal of one school bought a banner and told the children that the room having the highest average of pupils brushing their teeth every day for one month would have the banner hang in their room. After roll-call those who have brushed their teeth are asked to raise their hands, the count is taken and written on the blackboard, and a record kept for the month; in this way there is quite a competition between the rooms. We know the children are being truthful, because the parents have told the teachers how the children are always brushing their teeth; also when they come to us for treatments the majority of the mouths are in splendid condition. In several other schools the records are kept in the same way, on the blackboards, and one of the first things that meet one's eyes on entering a room is "Brushed Teeth," and below that the number for each day. In one school a child in a room who persistently forgets is sent at the end of the month to the principal's office for a reprimand, and in another school the children are allowed to all clap their hands when everyone reports "brushed teeth."

Many of the teachers are eager to assist us in every way, questioning the children between our visit as to the use of their tooth-brushes; also the motions of the prescribed method of brushing.

In one room of babies, a teacher particularly interested in our work gave talks on the teeth and brushing quite frequently. She had one little boy who always reported "brushed teeth," and on inquiring from an older brother found it to be true. This boy had a record of never being absent and never tardy. On the second visit when I went to this room for a tooth-brush drill this boy's seat was empty. The teacher was much exercised, and as the matter was being reported to the principal, she sent

one of the larger boys on a tour of investigation. This little boy was found playing truant, because his mother had been cleaning house, and when he went to get his brush to bring to school, as requested, it was not to be found, and he could not stand the disgrace of coming to school without his brush, when he had been reporting his daily use of it.

Another unit of the school system with which we must as quickly as possible make friends is the janitor, for much of our comfort depends on his good-will, as to heat, placing of equipments, etc., and with few exceptions these men are interested and friendly.

PARENTS' APPRECIATION.

The parents of the children are cooperating with us; we have very few who object to their children receiving the prophylactic treatments. Some of the reasons given are that the children are under the care of their own dentists, some do not want "charity" treatment, others are too ignorant to appreciate the work.

One day in going to a room to give a tooth-brush drill, I noticed a little girl in the front row with badly discolored teeth. After my work was finished, I stepped up to the child, looked at her teeth, and said to the teacher, who was standing at my side, "This little girl must have been overlooked." Before the teacher could answer me, the child spoke up and said, "Mother says on no account touch Helen's teeth." I said, "Oh, I'm so sorry, but come with me, and I will make a picture of your mouth to take to mother." We make an examination and chart of all cases where treatment is objected to and send it home by the child; often to the smaller children we call this "making a picture." Tears came to her eyes and in a very quivering voice she said: "Mother says, on no account to touch Helen's teeth." After assuring her that I would not touch her teeth, she accompanied me to the room where we were working, and I examined her mouth. Her teeth were bady in need of cleaning and polishing, also of a dentist's care, all of her first permanent molars having small cavities. I questioned the child as to why her mother objected to the treatment, but was unable to gain any information. Finally I decided to write a note to the mother. I explained the work to her, that the teeth were most carefully cleaned and polished, everything cleaned and sterilized between each child's coming to the chair, and ended by inviting her to come to the school the next day and watch the work. I sent the note home pinned to the child's dress, and our first patient next morning was Helen, wreathed in smiles, with the request—"Mother says, please clean my teeth."

I doubt if we have had fifty parents refuse treatment out of the 4666 children who have come to the chairs, and further than that, many are now responding by having their children's teeth filled, though their number is not large; but all good things have small beginnings, and when we find two or three children with teeth filled in a school, since our previous work, we feel amply repaid for all our efforts.

On our recent third visit to a school, a very bright, but very dirty little Italian girl came to us with a broad smile and the information that she had her teeth filled. On examination we found she had two large silver fillings in her two lower first deciduous molars.

SPREADING THE GOSPEL OF CLEAN MOUTHS.

The children themselves are carrying the gospel of clean mouths into their homes. We know this by many incidents that come to our notice.

During one of our visits to a large school in a thickly populated foreign district, one noon hour a small boy who had had his teeth cleaned that morning was seen sitting on the sidewalk surrounded by six or eight men, all talking and laughing in their excitable Italian way. On investigation it was found that the boy was holding his mouth open and turning his lips back to show how clean his teeth were, and

the men were delighted with the results. The above-mentioned school is one where there are over 650 children to whom we give prophylactic treatments, all foreigners, and we were told before going there that we might expect trouble and all sorts of objections from the parents, owing to their ignorance and lack of understanding of English. But we did not have a single instance where the parents objected, and in several cases where we found badly abscessed teeth that needed to be removed, we sent the child home with a request for the mother to come to school, and she invariably came, unless the baby was too small to leave, and after having it interpreted to her what we wished, she would give her consent and take the child to our dentist, or send it to him with an older brother or sister. In this same school one day I gave a tooth-brush drill in a room and a small boy brought five cents for a brush. The next day when I went to the room to speak to the teacher, he raised his hand. The teacher asked him what he wanted, and he said, "Could I speak to the nurse?" She gave him permission to come to me and he said, "Will you be here Sunday?" I said, "No, I don't come to school on Sunday. Why? What do you want?" The reply was, "I want a brush for my sister, and I can't bring the money until Sunday." On questioning I found the sister worked in one of the factories and would be paid Saturday night and was most anxious to have a brush like her brother's to keep her teeth cleaned; unfortunately, as she was not a school child, we could not supply her, but directed her to one of the five-and-ten-cent stores.

We also feel sure that the proverb "Cleanliness is next to godliness" is firmly fixed in one small child's mind.

One Sunday a clergyman went into a Sunday-school room, and after talking to the children a few minutes, said that, as he called upon the different children, he wanted them to stand and repeat a text from the Bible. All went well until this little girl's turn came. On being called, she was instantly on her feet and in a clear voice said, "A clean tooth never decays." This is one of our school mottos, and by frequent repetition had been firmly impressed upon the child's mind.

A CONSIDERATION OF ECONOMICS.

I was reading some interesting figures the other day that not only started a serious train of thought, but also made me turn to do a problem in arithmetics. It is estimated that in New York City 524,359 children have defective teeth, and that 80 per cent. of the absences from the classrooms are due to aching teeth or illnesses resulting therefrom. Every year 67,000 children fail to be promoted to higher grades because of absence, 80 per cent. of which can be laid to defective teeth. It costs New York City $1,000,000 to duplicate a year's schooling to those 67,000 absentees. Now, here is my problem: If, by careful planning and judicious spending, Bridgeport can clean and polish the teeth of 8400 children, teach those same 8400 children the proper use of the tooth-brush and care of their mouths, and fill a large percentage of the cavities in the permanent teeth of the 3826 first-grade children—all for ten or twelve thousand dollars a year—how much can New York City save of that $1,000,000 a year if they clean and polish the teeth of those 67,000 children, fill the cavities in their permanent teeth, and teach them how to care properly for their mouths? I leave it to you to find the answer.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

WORK OF THE PREVENTIVE DENTAL CLINIC IN THE BRIDGEPORT PUBLIC SCHOOLS.

By Miss ROSE E. HOUSE, Bridgeport, Conn.

(Read before the Connecticut State Dental Association, at its annual meeting, Hartford, Conn., April 20, 1915.)

IT is a privilege to describe the introduction of oral hygiene into the public schools of Bridgeport, a work that we believe will assist greatly in the physical, mental, and moral development of children, and which has proved to be most interesting.

Knowing that "A clean tooth never decays," we believe that by beginning early enough, at about two or three years of age, children's teeth may be kept in good condition until the permanent ones appear, thus insuring better digestion, and avoiding much of the toothache from which children suffer ordinarily. Moreover, by being on the lookout for the first permanent molars and the rest of the permanent teeth, and by keeping them perfectly clean, at least eighty per cent. of the trouble which otherwise occurs is prevented.

As yet we are not able to get hold of the children until five or six years of age, so we often find the permanent first molars in a hopeless condition on our first inspection. Still, in a majority of cases, they may be saved for good use during a lifetime if properly filled and kept clean. By having this done, and following up faithfully the home care, with the regular prophylaxis treatments and an occasional filling, the children would have a set of good teeth which should last them as long as they are needed.

It is a great wonder to me that the primary teachers get as good results as they do with the mouth conditions of their children as we find them.

ROUTINE PRACTICE OF TREATMENTS.

From September 9th to 14th, we worked in a temporary clinic room, bringing the children to it from the nearby schools to give them their treatments. This did not prove nearly as satisfactory as our present way of being located right in the schools and being regarded as a regular part of the system; for a strange young lady took the tiny ones to a strange place where everything was new and strange to them, and more trouble was experienced with them there than we have had since being in the schools.

On September 14th, we began moving our outfits into the school buildings. With the exception of one school, which is large enough to require the services of the entire force, two hygienists at a time work in a school.

In our first school we set up our outfits in the teachers' room, which has a lavatory adjoining, making a fine location. This room has a two-burner gas plate in it, which is most convenient for heating water. From twenty to thirty minutes are required in setting up the outfit ready for working.

When all is ready, we go to the room containing the highest class of first-graders, and after a few minutes' talk to the children, ask for volunteers, which we have never had any difficulty in obtaining. At first one of us went to the room for the children and took them back, but in a very short time this was unnecessary, the teacher sending two out

as two returned to the room. Very few showed any signs of timidity, and these were soon relieved by the pleasant and skilful remarks of the hygienist, and by letting them examine carefully all the suspicious objects to be used. A small hand mirror, which they can hold to watch the operator at work, has proved very helpful and entertaining to some.

After assisting the child into the chair and adjusting it properly, the bib is put on, the mouth carefully examined, and the temporary chart made out. The labial and buccal surfaces of the teeth —two or three at a time—are dried with a piece of cheesecloth and a pellet of cotton dipped in compound tincture of iodin is passed over the green and brown stains; then follows a thorough polishing of the surfaces of the teeth with fine powdered pumice and water. For a first treatment *only,* the operator is allowed the assistance of the rubber cup in the dental engine in removing these stains; thereafter only orange-wood sticks in porte-polishers are used. The occlusal surfaces are finished by the use of the brush wheel. Dental floss is passed between the teeth, and the bathing of the gums with phénol sodique is the final step in the treatment.

The time required for each treatment averages from thirty to fifty minutes on the first round, according to the condition of the patient's teeth. Subsequent treatments require about thirty minutes.

Between patients, the operator's hands are thoroughly washed, the instruments carefully washed in running water and sterilized, the oilcloth covers and bibs washed with ammonia and water, and the paper covers on the top of the cabinets changed, so that polishers and instruments being used and laid on the cabinet may not leave infection. Each operator has two sets of instruments. After school two children from the second grade are given treatments by each operator, and on Saturday morning from nine to twelve o'clock, six patients each are treated. Thus we are able to give the second-graders two treatments each during the year; the first-graders will receive four treatments.

In most of the schools, the principal and primary teachers had given the children a very wise and interesting talk on our work before our arrival, which was very helpful to us and aroused much enthusiasm among the children.

RECORD CHARTS SYSTEM.

The teachers either loaned their registers to us, or made out slips of paper for the children to bring to us, giving name, age, and address, which was of utmost importance in making out our temporary and permanent charts, for in a large majority of cases we found it impossible to gather these facts accurately from the children. Perhaps I might say just here that the temporary charts are sent home to the parents, and the permanent ones filed in the school record box kept at the clinic room in the board of health building.

THE CHILDREN'S INTEREST.

Since the children found that we did not hurt them, they are eager to come to us, and come and go with a happy smile on their faces. They are very proud to show their clean teeth to their teacher and little friends, and it is a common sight at recess to see them looking in each others' mouths.

The following incident will show how much one tiny boy wanted his teeth cleaned: It was on our second round one morning, that this very small, dilapidated-looking boy appeared and climbed up into the chair. The hygienist was busy arranging her instruments, and after the morning's salutation said, "Have you been brushing your teeth since you were here before?" To which he dropped his head and shook it, "No." "You haven't?" she asked. Again he shook it "No." "Open your mouth and let me see your teeth?"—which he did. "My, what dirty teeth those are. What shall I do with you for not brushing your teeth and keeping them clean?" No answer. "Think I'll have to whip you, and see if you can

remember to brush them next time. Do you want a whipping?" No reply. Then, after a pause she said, "Perhaps I'd better send you back to your room without cleaning your teeth. How would you like that? Jump down and go back to your room." Then the tears welled up in his eyes, and half audibly he said, "I want my teeth cleaned." "Would you rather take a whipping than to go back to your room without your teeth cleaned?" she said, wondering if she could have possibly heard aright. "Yes, I want my teeth cleaned," he said starting to cry. "Well," she said, "If you want them done as badly as that, I think I'll do them for you this time, and won't give you the whipping until I see whether they are dirty when I come next time. Will you try to brush them every day if I'll get them clean for you?" "Yes'um." So she cleaned his teeth, and he went out holding his head up proudly.

TOOTH-BRUSH DRILLS.

When our operative work was well established, and we were able to get children's tooth-brushes in large enough quantities to supply the first grade, we began our tooth-brush drills, Dr. Fones conducting the first one.

On the day previous to the drill, a circular was sent home to the parents telling what we wished to accomplish, and asking them to co-operate with us, and to give their children five cents to pay for a new tooth-brush.

At the time appointed for the drill, the supervisor and her two assistants enter with the tooth-brushes, which have been sterilized, and a tray from the sterilizer, the supervisor standing in the front of the room and the assistants to the sides or rear. The supervisor then inquires, "How many remembered to bring five cents for a nice new tooth-brush? Those who did, stand." The brushes are given to them, and they sit down. "Those who didn't bring five cents, and haven't any tooth-brush of their own, stand." Tooth-brushes are given to these with the understanding that we will trust them to bring it later to their teacher for us. In many rooms the entire amount is collected; in some there are a few who fail to bring the nickel. But no penalty or reproach is meted out to them if they fail to do so, for the teacher knows that it is impossible for them to bring it; so the board of health must bear that expense.

The brush question being settled, the next step is the inspection of their hands to see if they are in a fit condition to handle the brushes. If not, they are sent out to wash them.

Then comes a five minutes' talk on the importance of the tooth-brush being used by its owner *only,* and on the reasons why no one else must use it, and why we need to clean our teeth; also on the time when we should clean our teeth, viz, "before breakfast, after breakfast, after dinner, before we go to bed." After this, according to a regular form, the drill proper is given, seated, with the assistants passing up and down the aisles helping the children to hold their brushes correctly, and to make the right movements. We have four positions for holding the brush, and two movements in each drill. At the close of this first part comes another five minutes' talk on the care of the brush, emphasis being laid on the great necessity of keeping it clean by a thorough washing in running water before and after using, on rinsing it constantly while brushing, and on having a clean place to hang it up when through brushing. The pupils are also asked to repeat a number of times when it should be used each day. Then the drill is repeated, the children standing up. At the close of this drill the children sit down, the brushes are taken up and placed in the slots of the copper tray, washed separately under running water, and placed in the sterilizer to remain until the next day. Formaldehyd gas is used as the sterilizing agent. The next day another drill is given, after which the brushes are wrapped in waxed paper and given to the children to be carried home.

The teachers were asked to inquire

each day as to who had brushed their teeth, the aim being to remind them of this duty and to assist in forming the habit of daily brushing. We have been much pleased on our return visits to find a goodly number of the children's mouths showing marked evidence of their having brushed their teeth regularly in the meantime.

On request for the brushes to be brought back for a drill, fully ninety-five per cent. have been brought back, and at least ninety-five per cent. of these were in a fit condition to be used. The dirty ones are thrown away, and new ones given in their places. In one school where we were holding our first drills, some boys were so anxious for brushes that they broke into our clinic room and took two dozen brushes, which they gave to some of the children of a higher grade who were very anxious to own a brush, and thought this the only way to obtain one.

In going into a room a few weeks ago to conduct a drill, we noticed a tiny girl crying bitterly. The teacher went to her and asked her what was the matter. She replied that she felt very sick. When asked where, she pointed to her throat. As there were several cases of mumps in the school, the teacher told her she might go home, although no swelling was visible. She put her things on, and as she passed out the teacher said, "When you feel better, you may come back." We went on with our drill. About fifteen minutes later the child walked in smiling and holding up her tooth-brush. The forgotten tooth-brush was the cause of her sudden illness.

Next year we expect to extend prophylaxis treatment and tooth-brush drills into the third and fourth grades, and the year following into the fifth grade. After five successive years of treatment and instruction, the children should have the habit so firmly fixed that they will keep it up the rest of their lives.

EDUCATIONAL SUPPLEMENTARY INFORMATION.

During the past term, Dr. Fones and Dr. Robert H. W. Strang have given stereopticon lectures to the children of the third, fourth, and fifth grades on hygienic topics which are closely related to our work, as well as on the work proper, which have been most interesting and helpful to the children.

It is purposed to carry this educational work into the sixth, seventh, and eighth grades by means of talks, chart study, and stereopticon lectures. At the close of the stereopticon lectures, pamphlets giving full instructions for the home care of the mouth were given out. These pamphlets were fully illustrated, showing the proper positions for holding the brush, the movements to be used on the different surfaces of the teeth, and giving directions for the making and use of lime-water, showing positions for holding the floss, and giving a recipe for making a simple, effective tooth-powder at a moderate cost. The dental committee has just put into the homes of our first, second, and third grade children a pamphlet giving very valuable information on subjects bearing on our work, and also giving pictures of the hygienists at work in the various schools, the rooms during tooth-brush drills, the sterilizer, etc., thereby acquainting the parents with the work, and strengthening the bond of co-operation between the home and the hygienist.

We have had the heartiest co-operation from children, parents, teachers, and principals, and our success has been greater than we anticipated at the outset.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE LATE RESULTS OF THE CLEFT PALATE OPERATION.

By TRUMAN W. BROPHY, M.D., D.D.S., LL.D., F.A.C.S., Chicago, Ill.

(Report presented to Section VII, Sixth International Dental Congress, London, 1914.)

CONGENITAL fissures of the palate accompanied by harelip are so conspicuous, of such frequent occurrence, and their influence upon the patient so depressing, that measures looking toward their successful treatment have always been regarded by surgeons with deep interest. Harelip, with cleft palate, no doubt is one of the most distressing deformities which befalls mankind. The unfortunate sufferer, conscious of his deformity and his inability to speak distinctly enough to be understood by his associates, too frequently isolates himself and shuns the society of his fellow men. Knowing the importance of this subject, I deem it a high honor to come before this congress and to endeavor to explain the late results of this operation.

In order to present the subject clearly I have divided it as follows: Operations performed—(I) In Early Infancy. (II) In Late Infancy. (III) In Childhood. (IV) In Adult Life.

I. OPERATIONS IN EARLY INFANCY.

It is necessary to a clear understanding that a few of the immediate results should be brought to your attention. The immediate effect of an operation upon the palate in early infancy, *i.e.* before the age of five months, is the marked improvement noticed in the general nutrition of the infant. He is now able to take his food through the nipple with comfort and as a result he gains in weight and strength. In closing the cleft, the dental arch becomes normal and the line of union quite firm. The child is changed from one who is constantly fretting and ill to one who is contented. If this individual is seen ten to fifteen years after the operation, one will note that the dental arch is not deformed nor in any way different from an arch in a person of the same general features who has never had a cleft palate. The teeth occlude with little or no irregularity and the line of union in the upper jaw is hardly discernible. The line of union in the palate itself is marked by a faint line, and on pressing the hard palate a firm, bony arch is felt. The soft palate has developed and will equal in size, strength, and flexibility a normal one. If the operation is properly performed, the opening between the naso-pharnyx and throat will be sufficient for the performance of the normal functions. As most of these patients have harelip in conjunction with cleft palate, it will be noted that union in the lip is represented by a faint white line, and that the normal cupid's bow has been formed. The alæ of the nose are perfectly formed and the nasal septum is usually straight, unless the patient has since suffered with adenoids or other diseases tending to promote nasal deformities. No defect is noted in phonation, nor does the patient find any difficulty in compassing any vocal effort. In confirmation of the statement made above, I will present for your consideration the following cases.

As the first patient I present an American boy who had a complete congenital cleft palate and single harelip. He had a broadly separated nostril with the nose deflected to the side opposite the fissure in the lip. This boy was operated on for the first time when three weeks

of age. The widely separated bones were brought into contact by bending them together. The bones were not fractured. As usual, the silver wire and lead plates were used. The lip was operated several weeks later. The soft palate was corrected when the boy was about one year of age. The result is before you.

You will note that his voice is clear and resonant without a trace of any defect. You will observe that he has a good hard palate, which is firm and bony throughout. The soft palate is flexible and, as you see, capable of doing its work perfectly. It will be seen that lateral incisions were not necessary. They would have done no good and I am satisfied that they would have impaired the usefulness of the palate. The line of union throughout the length of the palate is scarcely visible. The line of union in the lip, while not done according to my improved method, is still very good and hardly noticeable. The nose, you will observe, is in the median line of the face and is of a good form. It would be difficult for the surgeon who bases his judgment on theory or the results of improper operations to convince his mother that my early operation on this boy was wrong.

The second patient I present to you is a young lady who was operated upon when an infant. The cleft in her palate involved not only the soft palate but two-thirds of the hard palate. As to the value of an early operation in her case, I will allow her to answer. You will observe the perfection of her modulation and the distinctness of her utterances.

Only two operators have devised plans for the correction of cleft palate in early infancy—Sir Arbuthnot Lane and myself. Both have been criticized more or less severely. As to the points at issue regarding Sir A. Lane's work, I cannot say, but as to my own I am satisfied that men have not succeeded in doing it because they do not understand the technique. Some of the illustrations and instructions that have been presented to European surgeons have been so faulty that to follow them would necessarily lead to failure. The broad statement that deformities should be corrected early and that they should be brought to as nearly a normal state as possible, is so obviously true that it seems to me no one should question it. Many surgeons have been and are of the opinion that cleft palate operations in early infancy are not expedient, since tissues break down and stitches cut out. With the improved technique, however, such unfortunate results should be avoided. I have seen infants upon whom Sir Arbuthnot Lane has operated whose palates have been completely closed. I have not, however, had an opportunity to study them with a view to ascertaining the quality of their speech. Sir A. Lane does not seek to secure a bony union, but closes the fissure with a flap. A solid, bony arch, therefore, would not be produced. The test of his work, as in all work, will be the condition of the parts in adult life and the ability of the patients to speak correctly.

The operation in early infancy brings into action the muscles of the palate. These, therefore, develop instead of becoming atrophied for want of use. Hence a good velum is secured with plenty of tissue, whereas if the operation is delayed the muscles cannot as surely be made to subserve the same purpose as tissues which develop through natural employment. The muscles of a cleft palate are not normally employed, and by operating at a very early age they are at once brought into use and their development is proportional to other tissues. Also, there is much less deformity in the bony as well as soft tissues. Therefore, the most important reason for making the early operation is that a normal condition is established which enables the patient to speak as children do who were born without this congenital defect.

II. OPERATIONS IN LATE INFANCY.

When the operation is performed in late infancy, *i.e.* from five months to two years of age, the conditions are a little different. The immediate effects are the same, but while in some instances the

alveolar borders are brought in contact by traction of the orbicularis oris muscle following closure of the harelip, the tuberosities of the maxillary bones still remain widely separated, and the posterior part of the cleft consequently will be widely separated also. This separation might have been avoided if the bones had been approximated at the proper time. In operations upon the palate, as time passes the difficulties increase. The palate produced by operation at this time of life is not, strictly speaking, normal. It usually differs in that the arch is broader and so remains. The wider the cleft the shorter the velum, and therefore the soft palate does not approach the posterior pharyngeal wall as it normally should. When the palato-pharyngeal muscles have been in part added to the end of the velum, the palate is made to reach the posterior pharyngeal wall. In broad clefts, the upper teeth usually occlude correctly with the lower. To accomplish this, the mandible becomes wider. Therefore, because of the operation being made during this time of life the jaws in the region of the molar teeth are wider than normal. The nose of a patient having single harelip and complete cleft palate is almost invariably deflected to the side opposite the cleft, and the nostril into which the harelip extends is widely expanded. The face is asymmetrical, though not always conspicuously so. Phonation is not clear unless the palato-pharyngeal muscles are partially utilized to lengthen the velum. The parts brought into play by the act of speaking are not as fully developed as in patients who are operated in early infancy. This is due to the fact that the muscles have atrophied from disuse.

III. OPERATIONS IN CHILDHOOD.

In operations during childhood, *i.e.* from two to twelve years of age, the same general statements apply as were mentioned in the previous paragraph. The soft palate in these patients, however, is not so flexible, and unless sections of the palato-pharyngeal muscles have been added to the velum it is too short. In these people the mental condition comes into the issue. It is unquestionably improved by the operation, as is well demonstrated by comparison with an unoperated patient. The child changes from a shy individual and one who shuns society, to one who is cheerful and happy. The defects in speech remain more or less, except where the patient has been properly trained by one who understands the mechanism of speech. On examining the hard palate it will be noted that there is a firm, bony arch, which has not been obtained, however, by drawing the bones together, but by the growth of osseous tissue between them. The line of union is not marked by a large deforming scar, and in many cases it can be found with difficulty.

IV. OPERATIONS IN ADULT LIFE.

Operations performed in adult life, *i.e.* from twelve years up, show the same improvement in the nutrition and mental effect. The patient, however, has greater difficulty in acquiring correct pronunciation, and unless he persists in the effort this is not obtained. In these people the lack of tissue due to the marked atrophy from disuse renders the operation more difficult, and the resulting palatal arch does not approach the normal with the same degree of accuracy as is seen in cases operated early in infancy. The arch is usually higher, the distance between the teeth greater, and the occlusion more or less defective. On palpating the palatal arch, however, it will be noticed that there is a firm, bony union in the great majority of cases. The line of union in the harelip is more conspicuous but is not disfiguring. The nose can be nearly corrected so that it, also, is not strikingly disfiguring.

I am satisfied that defective phonation has been due in many cases to lateral incisions in the soft palate. In my opinion this should never be done, for the following reasons:

(1) The tensor palati muscle arises from the scaphoid fossa of the sphenoid bone and the cartilaginous portion of the Eustachian tube. It is directed downward, then reflected over the hamular process and passes forward to be inserted over the surface of the soft palate. The action of the tensor palati muscle is to render the soft palate tense and to dilate the pharyngeal orifice of the Eustachian tube. The division of this muscle, as it passes over the hamular process of the sphenoid bone causes unnecessary hemorrhage.

(2) The wound creates a new field for infection and the tissues are more likely to break down.

(3) Once completely divided where it crosses the hamular process of the sphenoid bone, the muscle retracts to such an extent that it is never reunited, consequently the palate loses the function of one of its most important parts.

(4) Following the complete division of the tensor palati muscle, the pharyngeal orifice of the Eustachian tube no longer normally dilates and, therefore, defective hearing ensues. It must have been observed by all operators of considerable experience that when the tension of the palate is relieved by dividing the tensor palati muscle, defective hearing follows. This is due to the destruction of the continuity of the tensor palati muscle and consequent failure of the pharyngeal opening of the Eustachian tube to dilate normally.

(5) In making these uncalled-for lateral incisions, the principal branch of the posterior palatine artery is frequently divided, and the palate is therefore deprived of its chief source of nutrition.

(6) The lateral incisions cut off the nerve supply and muscular atrophy frequently follows.

(7) Following the incision, a mass of cicatricial tissue will be formed and a thick, clumsy palate be left instead of one which is flexible and resilient. Besides, with cicatrization there will be contraction and, consequently, defective speech.

(8) The operator who makes lateral incisions, usually draws the soft palate forward and upward in order to close the cleft, and by so doing the palate is made so short that correct phonation is impossible. Subsequently the shortening is increased by the contraction which takes place in the cicatricial tissue. While the surgeon who makes lateral incisions may close the cleft, he will find the short, thick, scarred palate will not bring to the patient the benefits anticipated. Any operation, therefore, which includes the making of lateral incisions of the soft palate and completely dividing the tensor palati muscle will be followed by defective speech and hearing. The division of this muscle is *worse than useless*. It is unnecessary and positively detrimental to the best interest of the patient.

(9) By reason of the cleft of the soft palate, the muscles do not develop as perfectly as they would if the tissues were united and brought into normal action. Like other muscles, they need exercise to bring them up to a high state of development. It is essential, therefore, to utilize all of the tissues available to form a palate of sufficient length to enable the patient to articulate distinctly. Too frequently we find that the distal border of the soft palate does not reach to the posterior wall of the pharynx.

It should be, therefore, the aim of the surgeon not only to close the cleft of the palate, but to avoid incisions with their resultant cicatrices; to preserve the continuity of the mucous membrane; and to lengthen the palate if possible so it will reach the posterior pharyngeal wall. This method of procedure will insure to the patient the best results obtainable.

In conclusion: To obtain the best results in palatal surgery, operations should be performed in early infancy, preferably before the third month.

PERSONAL OBSERVATIONS ON THE BROPHY PLAN OF DEALING WITH COMPLETE CLEFTS OF THE LIP AND PALATE.

By V. P. BLAIR, A.M., M.D., F.A.C.S., St. Louis, Mo.

(Presented to Section VII, Sixth International Dental Congress, London, 1914.)

THE early operation for the closure of patent facial clefts, especially the closure of the lip and alveolar portion of the cleft, it seems to me, has the following advantages:

(*a*) In the presence of an unclosed cleft the deformity of the individual neighboring structures increases as age advances. The earlier the cleft is closed, the more naturally will these structures develop and the better will be the speech and appearance.

(*b*) In very early infancy there is a resistance against shock that is very marked, probably related to the resistance which the child has to birth trauma.

(*c*) The bones are soft and can easily be bent from their distorted position to approximate the normal position.

(*d*) The rapidly growing tissues of early infancy heal most kindly.

(*e*) The early closure of the lip and alveolar cleft is a great comfort to the parents, and conserves the health of the child.

(*f*) Should the child succumb to the operation, both from the standpoint of economics and sentiment the earlier this occurs the better; but the death-rate, in properly performed operations at properly selected times, is very small.

Forcing the intermaxillary and anterior portions of the maxillary bones to approximately their normal relation to each other, and holding them in this position by passing wires through the maxillary bones, after the general plan proposed and popularized by Dr. Brophy, has the following advantages:

(*a*) The intermaxillary bone can be placed in its proper relation in front of the maxillary bones. If the alveolar processes alone are drawn together by a single wire, the intermaxillary bone is apt to take a position posterior to the normal, causing a flat upper lip and leaving the anterior part of the cleft wide and difficult to close.

The simple closure of the lip cleft in early infancy will draw these bones into this normal relationship in a few weeks; but when the lip cleft is closed over a wide alveolar cleft the lip restoration is rarely satisfactory and the ala nasi is very apt to be distorted.

(*b*) It makes possible a perfect closure of the lip, and especially the ala nasi, over a somewhat normally shaped alveolar process.

(*c*) By placing the intermaxillary bone in front of the alveolar process of the maxilla, the anterior part of the cleft can at the same time be very much narrowed or completely closed, which renders a subsequent muco-periosteal flap operation very much easier. It is difficult to close the anterior part of a wide cleft by flaps.

(*d*) I do not consider it practical to narrow the posterior part of the bony cleft to any material extent by this operation, but where the anterior parts of the palate processes are approximated the posterior part of the cleft becomes narrower in the next few months of growth, rendering the closure of the velum and posterior part of the hard palate much easier at a subsequent Von Langenbeck's operation.

(*e*) This operation renders possible not only the early perfect restoration of

the lip, which we do at the same time as the bone operation, but also the restoration of an anatomically normal velum within the first year of life.

Infants operated upon within the first twenty-four hours do exceptionally well and show no effect of shock. Between three and ten days the child may be icteric, which predisposes to hemorrhage. After the first week the child's digestion may have been upset by improper feeding. After two or three months the child does not tolerate the operation as well as earlier, and death may result from shock.

It is our custom in cases where there is a real loss of blood, or where the infant is inclined to bleed after the operation, to inject 40 cc. of fresh whole blood, drawn from the mother or father, under the pectoral muscles of the infant. The site is massaged and the blood is quickly absorbed. This stops oozing and restores the blood lost.

In one infant we drew the blood from an assistant, and there was a marked reaction for two days with a temperature of 106½°F.

If the wires in the maxilla are placed above and not through the tooth sockets, there is comparatively little subsequent disturbance of dentition. I consider the general plan included in the term "Brophy operation" the ideal manner of dealing with complete clefts of the lip and palate, and in our hands it has given the best results.

The criticism that has been urged against this operation, that it unduly constricts the nasal passages, is irrelevant, because the operation seeks to restore the proper relation of the maxillary bones, including the walls of the nasal fossi, and does not contemplate approximating the latter to an unnatural degree.

In the presence of a palate cleft there is at birth usually little or no absence of tissue, the width of the cleft being due to a spreading apart of the maxillæ. This point is easily demonstrated by comparing the width of the upper jaw with that of the lower. This operation seeks only to overcome a part of this abnormal spreading of the bones and incidental widening of the nasal fossæ.

PROCEEDINGS OF SOCIETIES.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

Forty-seventh Annual Meeting.

(Continued from page 1041.)

FRIDAY—*Afternoon Session.*

The meeting was called to order on Friday afternoon, May 14th, at 2 o'clock, by the president, Dr. Wright.

The first item on the program was the reading of a paper by Dr. CLARENCE J. GRIEVES, Baltimore, Md., entitled "The Relation of the Vitality of the Periapical Cementum and Adjacent Tissues to the Patient's Health and the Status of the Dental Profession."

[This paper is printed in full at page 1112 of the present issue of the DENTAL COSMOS.]

Discussion.

Dr. JOHN B. WEST, Elmira. Dr. Grieves has presented a paper which is in accord with the latest research work on apical infections, and one that is especially opportune at this time, when the medical profession is beginning to realize that many grave systemic conditions are secondary to local focal infections. We are well aware that Rhein, Ottolengui, Callahan, Best, and others have been doing pioneer work in this field for some time, but it is a subject of such importance to our profession that the truth offered by Dr. Grieves cannot be presented too often or too forcibly.

We believe the histo-pathology of the periapical tissues as presented by Dr. Grieves is correct, but we would like to emphasize the fact that, where pathogenic micro-organisms invade the periapical tissues either through the root-canal or by hematogenesis, the peri-cementum in contact with the apex becomes gangrenous, and the vitality of the apical cementum is destroyed.

From clinical observation and from a study of a number of roentgenograms of teeth with blind dento-alveolar abscesses, we believe the dental treatments of these conditions in the past to have been a failure.

We are convinced that it is impossible in blind dento-alveolar abscess or in chronic alveolar abscess, in fact, in any condition where pus has formed in the apical space, to cause a revitalizing of the periapical cementum by the use of drugs. As Dr. Grieves states, perhaps the most promising therapeutic treatment yet advanced is sterilizing of the periapical tissues by the ionization of zinc salts.

Nevertheless, the pericementum is not in physiological contact with the cementum, whenever pus has formed at the apical end of a root. Invariably roentgenograms of the periapical tissues show a rarefied area of bone surrounding the apex of the root. We believe that the resisting power of these tissues is lowered, and whenever the opsonic index drops below normal, micro-organisms reach this area of lowered resistance by hematogenesis, and these old infections light up.

In this connection we wish to emphasize the bacteria-holding power of the crypts of the cementum where the fibers of the peridental membrane were attached. The apical end of the root

being pitted, we can see no difference, pathologically, between the bacteria-holding power of the apical cementum and the cementum near the gingival margin in a pyorrhea pocket.

We agree absolutely with Dr. Grieves in his position on this subject. Whenever patients who are suffering from rheumatoid arthritis, arthritis deformans, endocarditis, amylaceous lesions of the kidney, and other diseases that have been traced to a local focus have been referred to us by the internist for a search for foci of infection in our field, we believe that when the roentgenogram shows rarefied bone areas and fistulas of chronic alveolar abscess are demonstrated clinically, our only course is to blot out those areas of lowered resistance either by apicoectomy or extraction. If we do not proceed in this manner, in the light of the research work that has been done by Hartzell, Henrici, Price, our essayist, and others, we are taking a chance on the patient's immunity which is not, in our opinion, justifiable.

Dr. Grieves mentioned three dangers which confront the dentist in operating on these tissues: (1) "Producing periapical tissue necrosis;" (2) "infecting that area which has lost its resistance by our processes;" (3) "if we succeed in closing the root-canal without infection, the arrival by hematogenesis of micro-organisms of low virulence." To our mind these three statements sum up this problem in a nutshell, and we wish their importance could be thoroughly impressed on every dental practitioner.

While there are many men in our profession today who realize the importance to dentistry of systemic infections through the dental path, and who are doing root-canal work in accord with modern surgical practice, still, from our literature and from discussions of papers at meetings, one cannot help but gain the impression that the ordinary root-canal operation will not stand the scrutiny of aseptic surgical practice.

Let us say right here that in our belief Dr. Grieves has done the profession a great service in sounding a note of warning regarding the common use of arsenic in root-canals, as we thoroughly believe that his position regarding the use of arsenic is well taken. Not only is arsenic used freely, but various mummifying pastes are used unscrupuously in too many cases.

The realization of the truth of the essayist's three statements and the carrying out of practices consistent therewith from a histo-pathological standpoint, will in our opinion fix the future status of the dental profession.

Dr. M. L. Rhein, New York. The paper of Dr. Grieves requires very careful study in order that his position be properly understood. The time allotted will not permit an exhaustive expression of opinion in regard to some of the points under discussion.

We have no difference of opinion as to the serious effect of an infective nidus in the periapical area. We are agreed upon the fact that such infections are liable to produce the most serious disturbances of health, and even the early death of the individual.

The essayist mourns the fact that the dental profession has been unable to present a technique of surgical therapy that will meet the demands of the internist. Many of us in the city of New York believe that we have fulfilled all the requirements of that demand. What is this demand? It should be, that all material that is liable to produce pabulum for micro-organisms be entirely removed; that every trace of pathogenic condition should be thoroughly eradicated, and the parts left, not only in a condition free from infection, but so that there will be no trace of nutrient media left by means of which secondary infection may take place. In short, the dentist ought to be able to say that as far as the periapical region of a root is concerned, reinfection is impossible.

The essayist very justly criticizes the use of arsenous oxid, formaldehyd preparations, and many other powerful irritants which are liable to keep up a constant destructive irritation in the periapical region. In this category of condemnation he has included the sci-

entific technique of surgical therapy which I have promulgated among the profession.

I am pleased to have Dr. Grieves openly state his point of criticism, because it should be the simplest matter to efface, if anyone desires to approach the subject with an unbiased mind.

The essayist constantly uses the expressions "necrotic tissue" and "necrosis of the cementum and the periapical area" in a manner that seems to be entirely inconsistent with an up-to-date pathologic understanding.

It is a great pleasure to agree with his objection to the use of arsenous oxid on account of the possibility of its producing a serious alveolar necrosis. No condemnation of this agent, for this purpose, can be made too strong. On the other hand, when referring to rarefication of the alveolar tissues, it is a common error, especially among roentgenologists, to speak of necrosis of the alveolar structure as found in the roentgenograms which they furnish with an opinion. Although there is a destruction of the alveolar structure going on in this infected area, which is evidenced by the loss of the osseous substance, this should not be spoken of as a true necrosis, where a distinct line of limitation is set up and a sequestrum is formed. The alveolar structure, on account of the great number of air-spaces intermixed with the bone, is very readily destroyed without a true necrosis occurring. We do, in serious cases, obtain a real necrosis of the jaw, and in all such conditions the symptoms are of such a nature that a correct diagnosis is very easily made.

The reason of the difference of opinion between Dr. Grieves and myself is entirely due to the fact that Dr. Grieves has only a theoretical and hypothetical knowledge of the technique of the surgery of the operation as taught by me. For some unaccountable reason he does not appear able to comprehend thoroughly what this technique means, because it does not in any sense violate any of the well-known histological principles on which he places justly so much importance. I thoroughly agree in all he says about preserving in a normal manner the vitality of the cementum and pericementum of the root. This vitality is in no manner concerned with the contents of the root-canal or any other of its divisions or ramifications of points of entrance into the root. It depends entirely upon retaining a normal circulation in the pericemental region, from which, he himself has said, this nutrition arises and on which it depends. On the contrary, the kind of imperfect root-canal technique which he advocates, in which the different foramina are not opened to their periapical aspect, and in which a filling is introduced, perfect or imperfect, but which leaves some final portion of living matter in the ends of the root-canals, in the majority of instances tends to produce the most severe inflammatory action of the cementum and pericementum of the root.

While it is true that with age slight thickening of the cementum takes place, just as a diminution in the caliber of the root-canal occurs, it does not follow that the picture of cementosis which the essayist has drawn gives us an idea of normal cementum in advanced age. The conditions that he has shown are all pathologic and not normal, and one of the means of inducing this is the inflammatory action of a small amount of living matter left at the end of a root-canal, which, in many instances, retains its vitality.

It has been my good fortune to have many operators complain to me of the fact that after they had completed what they considered a most satisfactory removal of the pulp tissue in a tooth which had shown no sign of pericementitis or pyorrheal inflammation, there has followed an acute pericementitis with loosening of the tooth and more or less exudation at the gingival border. This is no uncommon clinical picture, although it may show itself in many varied phases. It is a fact, however, that if the different canals of such a tooth are explored clear through into the periapical area, this pericementitis with its loosening of the root, exudate,

etc., will all at once subside, and the parts will return to a normal condition. This is a clear clinical demonstration of the fact that the loosening of the root and all the other symptoms of pericementitis were due to the inflammation set up by the remnants of living pulp tissue. In what manner the essayist has argued to himself that reaming out the canals through the foraminal entrances can interfere with preserving the life of the cementum is beyond my perception.

The other important point of objection raised by the essayist is directed against permitting the root-filling to pass through the foramen, and also against the possible effect of sodium and potassium or ionic medication on the periapical tissue. The theory of treatment of infected periapical areas must be based entirely on correct and well acknowledged surgical principles. These consist in the entire obliteration of the diseased area. In order to accomplish this, the intelligent surgeon avoids the pitfall of a great many specialists, that is, too much conservatism. It is essential that an area of healthy tissue be removed at the same time in order to be sure that no diseased tissue is left behind. This is precisely what sodium and potassium and ionic medication do when they are properly used. The essayist is in the greatest error when he speaks of the use of sodium and potassium leaving necrotic areas behind. This is a chemical impossibility, unless the use of this agent is terribly and unwarrantably abused. Sodium and potassium is never intelligently used except in very small quantities. A given quantity of this material unites with a given quantity of organic tissue. This union is accomplished with so much intensity that, when it is completed, both parties to the union are entirely effaced, and the leaving behind of necrotic remnants is impossible. Ionism, when used properly, acts in the same way; that is to say, its escharotic action is self-limiting. This is in contra-distinction to that of formaldehyd and kindred preparations; whatever remnants remain behind are practically inert and are most readily absorbed. The force of all destructive agents in the periapical area is directed to the point of least resistance, the alveolar structure. The great resisting power of the pericementum amply protects the cementum from injuries in this manner.

The essayist's strictures against immediate root-canal filling are well justified, as it is impossible to form any correct idea of how much of the root-canal has been cleansed until correct roentgenograms have been studied, after the first operation has been completed. While it is admitted that a good roentgenogram cannot be easily made the sole basis of diagnosis, yet the essayist's strictures against the value of roentgenograms are not well chosen. For ordinary work, frequently any kind of a picture will do, but when it comes to a careful discrimination and study of the irregularities of root-canals, then it is frequently necessary that the picture be taken at different angles and under different conditions, and, what is of the greatest importance, that it be focused to the very finest point. This focusing can only be done with a very low amperage and necessitates an exposure of at least twenty seconds, if such detail is desired as will permit the field to be effectively studied. If sodium and potassium be used for the purpose of reaching the end of the canal, no fear need be had in regard to infective matter being forced through the foramina, nor should any drugs of any kind be left in the canals, as they will but interfere effectually with a correct understanding of the condition of the canals. It is freely admitted that in a certain percentage of cases it is not possible to get to all of the foraminal ends, but this percentage is very small, and there should be no compromise with such teeth. The only safety for the patient rests in the immediate extraction of teeth which cannot be handled in such a way that the operator can prove that the foraminal exits have been sealed. Issue is taken with the statement that the various ramifications and foramina

are not filled by this method. I will show upon the screen a picture of an upper molar which is not an extraordinary one, showing clearly a number of different foramina. In looking at this image, you can judge of the possibility of sealing different foramina. In reference to the protrusion of the root-filling through the foramina, it may be of interest to the essayist to learn that there is no intention to have the filling material do more than encapsulate the end of the root with gutta-percha. Gutta-percha is one of the most compatible materials that can be placed alongside the soft tissues, and it is well known that, if it is used in this way with every regard to thorough asepsis, there is practically no reaction from the tissues.

The therapeutic principle that is desired, and that is imperatively necessary, is that no place of possible habitation of wandering micro-organisms should be left in the periapical area when the operation is concluded. This object can never be attained unless the periapical end of the foramen is sealed. If the root-filling comes within the minutest fraction of sealing this foramen on the periapical aspect, it will leave this microscopic crater as a place of habitation for micro-organisms. It is on this account that osseous regeneration of the alveolar structure has never been attained by the essayist.

It is not the intent of the operator to force the gutta-percha through to any great distance, but in the act of attempting encapsulation, it very frequently occurs that the gutta-percha is forced through to an appreciable extent. This will produce some trauma, the same as follows ordinary surgical operations, but it soon passes away. It does not do what the essayist claims it does, viz, interfere with regeneration of bone tissue. On the contrary, the limited motion which takes place in this joint in no way imperils the condition of the gutta-percha or the normality of the structure in which it is placed.

I will show upon the screen a roentgenogram of a root-canal filling which I introduced in this way over twenty-five years ago. I have three different views of this same case, and each of them shows the protruding gutta-percha and alveolar structure that is absolutely normal, according to my interpretation of normal tissue, and I should say in justice to myself that this opinion is coincided with by many roentgenologists of repute of whom I have asked an opinion, since the essayist claims that this did not show normal alveolar tissue. I will also show you a picture of regenerated alveolar structure which was taken a year and nine months after the root was filled, and which the essayist claims represents fibrous tissue and not osseous structure. Only a few days ago I showed these pictures to that eminent roentgenologist, Dr. Caldwell, and his associate. They unhesitatingly stated that there could be no question of the new tissue not being bone. They could not understand how any roentgenologist, after observing the picture, could arrive at any other opinion.

It would be very interesting, if time permitted, to trace the essayist's story step after step and show that the technique which I have promulgated in no way interferes with the health of the cementum. When the cementum is once attacked by necrosis, then I agree with the essayist, as I have always said that our only recourse lies in apicoectomy. Unfortunately, however, many operators have been accustomed to make a diagnosis of impaired cementum when it does not exist. The diseased area lies in the alveolar structure, and as a rule never interferes with the normality of the cementum, which is amply protected by the pericementum.

The essayist has spoken with some feeling about the lack of a dental sense of histo-pathology. I thoroughly sympathize with this statement, only it would be better expressed by saying that dentistry suffers from the lack of educating its students in the ability to make a proper diagnosis. The method of attempting to educate dentists in regard to localized pathology—which cannot be dissociated from any part of the body—without their being educated in each

and every disease that can attack the human body, is the sole cause of this lack of a sense of pathology, which is due primarily to the fact that it is impossible for them to learn to make a proper diagnosis as long as they are ignorant of what may happen to other portions of the body. The practical fact in regard to this important subject is that the essayist has presented to us a theory in which he has offered no evidence to disprove the clinical and radiographic evidence which I have produced for some time to substantiate the claim that the technique which I have introduced to the profession fulfils the requirements of leaving the parts not only in a healthy condition, but so that reinfection cannot take place.

Dr. R. Ottolengui, New York. Dr. Grieves has given us a very pessimistic picture of this subject, and I feel that you would all go away feeling very sad if you do not see a picture of the same subject drawn by an optimist.

I agree with everything the essayist has said about arsenic. As far as I can remember, I believe I have not used arsenic more than two or three times in the last eight or nine years, and I think I have regretted it—*two or three times.*

I also believe that the essayist sounds a very timely note of warning when he tells us that many medicaments are used in too great strength. A very prominent surgeon said to me once, "I cannot understand the courage you dentists have in using everything just as it comes out of the bottle. You want everything full strength, while we use everything in dilutions."

The essayist has raised before us the bugbear that, while many of us have been trying to clean the canal to the end of the foramen, there really are many foramina, multiple openings at the ends of these roots, and he questions our ability to fill them. We do not need to worry about these multiple openings at all. There is probably one main foramen, and all the other openings are merely channels for the entrance of nutrient vessels, and if we remove a healthy pulp, there is not the slightest doubt to my mind that these channels are still filled with nutrient vessels carrying blood, closing up at the pulpal ends, healing, and terminating in a healthy condition; so we need not worry, provided *we start with a live, healthy pulp.*

When dealing with infected conditions we have a different picture, and then we must determine what to do. Dr. Grieves has shown us a lot of danger signals and has not pointed out any remedy, but I am going to try to show you the optimistic side and point out that there is a remedy, and that all we have to do is simply to be a little more careful in our diagnosis and a little more capable in our technique.

The particular question I want to try to answer is, "Shall we carry our canal filling *to* or *through* the apical foramen?" I think it makes a difference what the conditions are. For instance, if we remove an uninfected living pulp, there is no reason to believe that the pericementum is other than vital and healthy; consequently I can see no reason why we should protrude broaches, wires, or gutta-percha or anything else through the apex of the tooth. I therefore believe that every precaution should be used to fill such a tooth to the foramen and no farther.

But in the presence of infection the problem is quite different. Then is it that we must remember the possibility of the so-called multiple foramina, and the further possibility that the nutrient vessels which should occupy them may have died. But I do not believe that these microscopic vessels will die, so long as the pericementum remains in a state of health at the point where these vessels emerge from the pericementum; or to state it otherwise, we need not worry about multiple foramina so long as they are outwardly covered by healthy pericementum. If, however, the pericementum be dead, so that these multiple foramina are uncovered, then of course their contents can no longer be living, and must be counted as infected or at least as infectious tissue. It is true, as Dr. Grieves has said, that the radiograph does not positively inform us of

the existence and the whereabouts of these multiple foramina, but our knowledge of tooth anatomy quite sufficiently guides us in our choice of treatment. Usually these vessel foramina enter quite near the true foramen, though occasionally one or more may be seen along the side. In deciding upon treatment, then, we must study the radiograph carefully, and also consider the history of the case. When only the extreme apex of a root is involved in the rarefaction disclosed by the X-ray, then we are reasonably safe in resorting to thorough sterilization of the canal with Schreier's sodium-potassium, which will at the same time destroy and sterilize the contents of the extra foramina.

This accomplished, the canal must be filled with chloro-percha sufficiently fluid to be forced into the extra foramina and through the major foramen, out of which it should exude so as to flow over and around any part of the apex which is denuded of pericementum, thus not only coating the root-end with an aseptic non-irritant shield, but at the same time covering over the outer openings of these extra foramina. If, however, the radiograph shows that an excessive portion of the apex is probably denuded of pericementum, then we must decide between the possible cure by ionization and the radical operation of apicoectomy. May I show you just a few cases illustrating these various modes of treatment?

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Case 1. The patient was a man, age about thirty. He presented with the lingual enamel split by a blow from an otherwise sound central incisor. The tooth was very sensitive along the surface of the fracture, and was temporarily covered with cement. Two days later he presented with the pulp dead and an acute alveolar abscess. Fig. 1

shows this tooth with a wire in the canal after pulp removal. The infection having been of such short duration, there had not been time for any great destruction of the pericemental tissue. Consequently the root-filling should extend through but not beyond the foramen. Fig. 2 shows the canal filled in this manner.

Fig. 7 shows the condition after correct canal filling, root amputation, and extensive curetment. This abscessed area permitted probes to reach the soft tissues of the palate, and its extent may be gaged by the fact that at the first dressing nine inches of quarter-inch iodoform dressing were used. This case necessarily healed very slowly, and Fig. 8 shows

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Case 2. The patient was a man of about forty-five. He exhibited a chronic alveolar abscess over the upper lateral incisor. The radiograph (see Fig. 3) discloses the fact that the pericementum has been lifted away or destroyed from the apex of the root. Fig. 4 shows the tooth with a wire inserted to the end of the canal. Fig. 5 shows the canal filled with an overflow of chloro-percha perfectly encapsulating the denuded end of the root.

Case 3. A young man, age seventeen, presented with a chronic alveolar abscess over the lateral incisor, with imperfect root-filling, the end of the root extending to such a distance into the rarefied area that nothing but a radical operation promised a cure. (Fig. 6.)

the condition ten months after the operation, at which time all dressings were abandoned. Fig. 9 shows the condition eighteen months after the operation; the bone is seen to be regenerating nicely.

Dr. Grieves has raised the point that bone will not form about gutta-percha. Those who show abscessed or other infectious conditions about gutta-percha forced through root-canals must be prepared to prove that the gutta-percha was sterile when introduced and that the surrounding tissues were free from infection at the time, before they can establish the fact that the accidental pro-

trusion of gutta-percha is dangerous. That absolutely sterile gutta-percha will be tolerated by the alveolar tissue, and that repair and even rebuilding of bone about such gutta-percha may be expected is abundantly proved by the following radiographs:

Case 4. Fig. 10 shows the condition about a replanted tooth as disclosed by a radiograph taken four years after the writer had replaced the tooth, for which reason he is

Fig. 10.

Fig. 11.

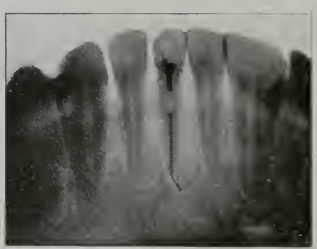
in the position to state positively that the gutta-percha was sterile when used as a canal filling, and that it was introduced in an aseptic manner. Note that the root has been resorbed, and that new alveolar bone has formed about the gutta-percha filling. Fig. 11 is a radiograph taken four months later, when the tooth was loosened by biting on a hard substance, and so firmly was the gutta-percha embedded in the bone that we note the fracture of the gutta-percha.

Case 5. The patient, a woman of about twenty-five years, had suffered for three years with a mysterious swelling of the chin. The radiograph (see Fig. 12) disclosed a non-fistulous abscess on a lower lateral incisor. After root-canal cleansing, ionization was used twice, and the canal was filled as shown in Fig. 13, where we see that the gutta-percha cone was accidentally protruded to a considerable extent beyond the apex. Nevertheless a radiograph (see Fig. 14)

Fig. 12.

Fig. 13.

Fig. 14.



taken fourteen months later shows that the previously diseased area has been completely filled in with new bone.

I believe Dr. Grieves asked if anyone had ever protruded gutta-percha into the tissues, expecting the tissues to tolerate it. Some years ago I was visiting a prominent surgeon who was very much distressed because he had had a failure

in his hospital, where a man had suffered from fracture of the femur, which had been neglected until necrosis had destroyed one-half inch of the bone. You can easily realize that, with a half-inch of the femur missing, a man's leg would be useless unless the bone was replaced. He had followed the procedure of making a ferrule from the femur of an ox, dissecting down the two ends of the bone and ligating the two ends of the man's femur into this ferrule of ox bone. This had been left *in situ* for several months, and when it was taken out it was found that there had been no growth of the bone through the ferrule. I said to him, "I believe you can follow a dental precedent here. I believe, if you make a ferrule of base-plate gutta-percha, and have the ferrule sterilized and placed over the two ends of the bone, having softened it so that it can be spread over the ends and made to fit tightly around the bone, new bone will grow through the gutta-percha ferrule." He did this, and four or five months afterward, when the gutta-percha was removed, the bone had united through the base-plate gutta-percha ferrule.

Dr. Grieves (closing the discussion).* I wish first to thank Dr. West for his remarks, and to take up the slide which I requested Dr. Ottolengui to show us. You will recall that the tooth, extracted and filled with gutta-percha, with its apex trimmed as usual, had been successfully implanted for some time. The series of excellent slides shows a progressive resorption of this root, as is observed in all implanted teeth, which finally reached clear down to the gutta-percha root-canal filling, leaving it in perfect contact with the alveolar bone. It is well recognized that all implanted teeth are attached by ankylosis, and do not normally sway as do those with normal peridental membrane, and that the deposit of alveolar bone in the resorptive bays cut in the roots holds the tooth rigid; it is also known, from comparative anatomy, that this very rigidity finally accomplishes the destruction of every implanted tooth, because in the freely moving mandibular articulation of all the mammalia there is no known instance of the occurrence of this type of "bone of attachment" which is found in the lower orders. The point I wish to make clear is that this gutta-percha filling was at first firmly fixed in the alveolus by the very process of resorption and deposit, the reparative process in a tissue, the cementum, with which the cells can lie in physiologic contact, and it was not, as I said in the paper, swaying as a normal mammalian tooth attached by peridental membrane should.

The last slide more than proves my contention, because as soon as enough of the root was absorbed to allow motion, and the tooth began to tilt, the gutta-percha root-filling, firmly held in the bone, fractured. In the last slide you noted the large area about the portion with the gutta-percha apparently protruding, which moved with the tooth, and particularly good bone about that which did not move. I am deeply obliged to Dr. Ottolengui for bringing this slide, and I call your attention to his statement that he intentionally perforates and projects his filling only in abscess cases, or where there has been destruction of periapical tissue, while Dr. Rhein claims to perforate and protrude his filling in every case.

Relative to Dr. Rhein's discussion, much might be said were there time, and I consider that all his contentions have been answered in my paper. In his boisterous manner he assumes that I have some personal bias, and that I am attacking him, while my whole plea was for a greater regard for the vitality of the adjacent apical tissues, as those will recognize who listened intelligently and saw the slides. I have ample proof in my own practice, where I have been doing ionization for over a year, of the destruction of the membranes and absorption of the alveolar process by this

* Dr. Grieves having given the time immediately following his paper for the reading of the reports of Dr. Gies and the Research Committee, the following discussion was written by consent of the society.

method, also of the bad effects of pumping sodium and potassium through the apex. The latter is a most valuable remedy if confined to the tooth, but in case of perforation it is forced out into the tissues, and while it may combine chemically with alveolar tissue, as Dr. Rhein says, it also destroys it. Therefore I believe in its use in the tooth if not applied too radically, but not when it is forced out into the tissues, as I believe Dr. Rhein applies it. I have seen the alveolus all "shot up," and the patient in pain for a few days, with radiographic proof of as great a periapical necrosis as from arsenic or infection, and sometimes a real periosteitis accompanied by the loss of the tooth from both these procedures. No one denies the sterilizing value of either of these drugs. I have used mild iodin ionization successfully, and by "mild" I mean such light currents as will carry the iodin without coagulating the tissues. Dr. Rhein's method, or any method, can at best only destroy the infective element lying in the tissue. The trouble lies here as in the old antiseptic surgical period: he destroys a comparatively large area of good cells and coagulates the tissues in his attempt to sterilize a small area, and leaves it all there. Good surgery, consisting in curetment and apicoectomy, would remove all such, leaving a healthy blood-clot for normal repair. So, in instances I have known, other operators have been compelled to remove by good surgery all the tissue Dr. Rhein says he does not damage by using elements which may be good chemically but are bad biologically. Ionization and sodium and potassium destroy and deeply oxidize tissue, just as did the old cautery treatment; every surgeon now recognizes the dangers of leaving this scarred and shortly-to-be-necrotic tissue as a nidus in the body, a fitting medium for microbic invasion and adaptation. The old idea of cauterizing out the tonsils rather than the recent knife operation is an example, and this method is roundly condemned, because all the organisms lying deeply in the tissue are not destroyed, while the cells are, which in turn only furnishes greater pabulum for microbic growth. I am told that one of Dr. Rhein's favorite demonstrations to his class—of which, unfortunately for me, as he implies, I have not been a member—is the shriveling of the muscle fibers in a piece of beef exposed to ionization of sodium chlorid and a zinc point. This results in true tissue coagulation and necrosis, he claims, by the formation of zinc chlorid. I claim that it results by nascent chlorin, principally, because the loss on the zinc point is infinitesimal in many applications; also it is, I believe, poor chemistry to say that zinc chlorid would be formed under these conditions. Dr. Rhein objects to the oxidation of tissue by formaldehyd, carbolic acid, etc., but does not hesitate to oxidize and destroy cells with sodium and potassium or nascent elements, or even zinc chlorid, if you please. I am not at all disturbed by Dr. Rhein's strictures on my lack of knowledge of pathology when he criticizes the use of the term "tissue necrosis;" it would mean just what it says to anyone trained in modern pathology. There can occur necrosis of all types of tissue, other than bone. Minute areas in the soft tissues with little demarcation are not unusual. It was these I had in mind. Evidently Dr. Rhein knows no necrosis except that of bone in a large way, the old idea of arsenical necrosis of the jaws, and when he speaks of "air-spaces intermixed with bone" occurring in the living body, I am willing to rest my argument there, and let you decide as to his pathology. His utter lack of comprehension of the normal and increasing cemental deposits which occur at the apex throughout life, which have been described by all histologists, and which he could study in known specimens out of the mouth, if he would only take the time, accounts for the errors into which he has fallen, and which all those who depend entirely upon radiographs are apt to make. I repeatedly said in my paper, and say again, that these deposits are not pathologically hyperplastic, but are evidences of normal growth according to age—re-

parative processes. When Dr. Rhein has ground, decalcified, and studied as many apices, particularly of roots that he has treated and of which he knows the histories, as I have, I will be willing to again discuss this matter with him; at present I should prefer to leave it with the authorities quoted.

Dr. Rhein seriously misquotes me when he says that I disparaged the radiograph; no such conclusion can be reached from anything I have ever said. I believe in, use, and value radiographs, but they are far from the whole story; it is so easy to mask a periapical area by shifting the tube a bit. I would no more condemn a tooth solely on radiographic evidence than I would claim complete recovery of a periapical area on the same evidence without clinical data. Dr. Rhein agrees with me that necrosis of the cemental apex is nearly always fatal to the tooth, and that then nothing but apicoectomy will save it, and that rarely; and yet he believes that all this which he does to the apex will not produce this necrosis by damaging the tissues beyond the peridental membrane. That he has little knowledge of the pathology of this whole area is made plain in this remark: "Unfortunately, however, many operators have been accustomed to making a diagnosis of impaired cementum when it does not exist. The diseased area lies in the alveolar structure, and, as a rule, never interferes with the normality of the cementum, which is amply protected by the pericementum." After all that my paper contained—which I feared the society would consider too rudimentary—relative to the attachment of the pericementum to the tooth, its blood supply, and the fact, which all histologists know, that the pericementum cannot lie in healthy contact with the apex of a pulpless tooth if the alveolus and its blood supply be destroyed back of it, we will not waste time further on this remark. I wish Dr. Rhein would tell us how he knows from radiographs that the pericementum covers the apex when the "alveolus is destroyed beyond it." How, moreover, does he diagnose a necrotic apex? I am not convinced that the chloro-percha mixture left in the tissue—and I understand that iodoform is occasionally incorporated with it—is really as inoffensive as Dr. Rhein would have us believe. In my experience, any solvent makes what we call gutta-percha, which is gutta-percha with a large percentage of zinc oxid and coloring matter, very porous; if allowed to dry it shrinks from the root-canal walls; and on contact with the soft tissue it swells up. I am not at all sure that it fills the perforated root-apex as well as the radiographs appear to show. The metallic salts figure in the radiograph. I can pump a salve of zinc oxid, which is no filling at all, through an apex and get the same type of picture; pure gutta-percha is scarcely visible in a radiograph. I shall also have to be further convinced of the sterilizing power of chloroform used as a solvent, and to my mind Callahan's method is nearer the ideal. We all know that it is perfectly possible to enlarge and manipulate radiographs by photography to show almost anything. I displayed on the screen two of Dr. Rhein's so-called successful root-filling cases, which he pubished in the *Items of Interest,* and he did not even recognize them. In these the rarefied areas were quite as large as other apices where the fillings did not project through the root, and would of course have been condemned by him. You can read almost anything into a radiograph, but I am not prepared, even in the face of so eminent an authority as Caldwell, to admit that what Dr. Rhein shows around the immediate root-ends is good bone, for, as I said in the paper, I have cut down on such areas, only to find no bone and often to obtain cultures. The only radiographic authentic evidence is the repetition of the film later from the same angle as in the first picture, and I would never venture an interpretation of any one exposure.

I am glad that Dr. Rhein has mentioned the fact that we have discussed this matter at other meetings, because that gives me an opportunity I would not otherwise have had, to say that at Washington two months ago he stated

that he perforated and projected in every case; in Brooklyn, a month ago, he declared that he did it in only about one-half his cases, and he does not state what his practice is today. This raises the question as to just what he *does* practice, anyway! From all that he has said in opposition to any filling which does not project—and judging from all the noise that he has made about it, a filling is not correct which does not pass into the soft tissues and beyond the root, and yet in Brooklyn he said that he did not practice protrusion in all cases—then, according to his own contradictory statements he did not fill those roots correctly. Obviously a practice cannot be right and wrong at the same time. You must either protrude the gutta-percha point every time, or not at all, to be consistent. Further, every foraminal opening must be perforated and the filling projected, no matter what its curvature or how many openings in the apex. Have you ever noticed how straight all these root-canal fillings look apically in radiographs, and how crooked the root-apices, of upper molars, for instance, look when extracted? The doctor remarks that "osseous regeneration of the alveolar structure has never been attained by the essayist," and implies that I never have really filled a root-canal—this might be taken personally, did I not know M. L. Rhein. Once in a while I *do* fill a root-canal, and I would suggest the study of anybody's library of radiographs by a committee from this society, believing that it will show as many rarefied areas about well-filled roots as about those not so well filled. The rarefied areas, which I have repeatedly claimed are caused by devitalization and destruction of surrounding tissues in the effort to devitalize the pulp and fill the canal, not being necessarily prevented by the perfect root-canal filling. Dr. Rhein presents a radiograph of an operation done twenty-five years ago and claims great results. I wonder if he was taking radiographs that long ago. If not, how does he know what the condition of the alveolus was prior to the operation? How far did he then intend to protrude his filling? Maybe it was an accident. And how recent are these pictures? To my mind this one slide presents beautifully the point made in the paper relative to the resorption of the apex, leaving as my slides show good bone near the gutta-percha point. Dr. Rhein claims that I have presented a theory only, while I believe that the slides of cases which I have shown are proof of my contention as far as the work has gone. I am astonished that he repeatedly claims by his method to produce in a septic apex and infected surrounding tissue an area which will be "absolutely free from further infection," and in which "reinfection cannot take place." He evidently has no conception of blood-borne infections or those conveyed by endogenous means. Two weeks in my clinic at the hospital would, I am sure, convince him, if he be of unprejudiced mind, that there are no areas in the human body which are absolutely free from infection. Even a projecting gutta-percha point in such a long-suffering tissue as the alveolus might finally be the area of lowered local resistance to hematogenic infection. I thank the society for their courtesy in asking me here, and apologize for the length of my remarks.

[The remainder of the session was devoted to the reading of Dr. Gies' report, which with the ensuing discussion will be published in the November issue of the Cosmos.]

Friday—*Evening Session.*

The meeting was called to order on Friday evening at 8 o'clock, by the president, Dr. Wright.

The President read a telegram from Dr. John Rogers, expressing his regrets at being unable to attend the meeting and take part in the discussion of Dr. Gies' paper.

Report of Fellowship Committee.

The next order of business was the report of the Fellowship Committee, Dr. W. J. Turner, chairman, as follows:

To the Council:

The Fellowship Committee beg to report that they unanimously recommend that Dr. Charles N. Johnson of Chicago be elected a Fellow of the Dental Society of the State of New York, and that in recognition thereof, the Fellowship medal be presented to him.

Respectfully submitted:

W. J. Turner, *Chairman*,
Rud. H. Hofheinz,
A. R. Cooke,
L. Meisburger.

Dr. Wright then presented the Fellowship medal to Dr. Johnson, addressing him as follows:

Dr. Johnson,—I wish to extend to you my most sincere congratulations. There are many pleasures in connection with presiding over this body, but the greatest pleasure of all is the privilege of standing here and in the name of the Dental Society of New York presenting to you the well-earned Jarvie Fellowship medal. And here I would like to congratulate the committee upon the selection of one so worthy of the honor. Could I obtain the voice of our entire membership, I assure you there would not be one dissenting voice.

It is customary on occasions of this kind for the presiding officer to present a somewhat lengthy, studied, elaborate address, dwelling upon the life, the character, the marked ability and integrity of the recipient, lauding his upright manly conduct as a citizen, his kind and tender care as a father and his ever-loving, moral, and virtuous life as a husband, until I wonder sometimes if the recipient of the honor realizes who is being talked about. And I assure you, were his wife and family present, I would not be surprised to see them shed tears of joy over the newly discovered evidence of the greatness and purity of the one so dear to them. I have written an address along the usual lines, but, Dr. Johnson, your innate modesty appeals to me, and I have decided to spare your blushes and tell you a story.

This is an old, old story. I heard it myself nearly thirty years ago, and the man then relating it said he was almost ashamed to tell it because it was so old, but I assure you, gentlemen, it is suitable for the occasion. Those of you who have heard it many times are at liberty to read your evening paper.

Go with me back to one of the early centuries, in one of the far-eastern countries noted for its many magnificent temples filled with wonderful carvings. A new temple was being erected; it was nearly completed, and the workmen were engaged in carving the capitals and the arches. An old man applied for work, but it was refused him; he applied again and again, until finally the master workman took him around to the rear of the temple, and there, on a scaffold, set him to carving one of the arches. The old man was faithful in his work. Every day from sunrise to sunset, the sound of his chisel and mallet resounded through the corridor of the temple. One night, as the workmen were starting for their homes, it was noticed that the old man was missing. Someone ascended the ladder and there on the scaffold found the old man dead—his work was finished; he had died at his post. Upon that arch he had carved the beautiful figure of an angel. The face was that of his only child, a daughter who had died just as she was budding into womanhood. It was all the old man had left to love, and life held no charms to keep him. Every curve, every line of that figure, every feature of that face was perfect in every detail; it was a masterpiece.

Years passed. It was found one morning that, when the sun reached her utmost northern meridian, as she rose over the eastern hills, the full splendor of her rays burst through a stained glass window, falling directly upon the figure of the sleeping angel, showing a halo of glory around that face, which transformed the inanimate into almost animate, living, speaking life. It was a marvelous transformation. As long as that temple stood, thousands came on that mystic morning to behold and worship at the shrine of the sleeping angel. The old man had "builded better than he knew," and "his works did follow him."

So, gentlemen, with Dr. Johnson. For years we, the older men in the pro-

fession, have heard the sound of his chisel and mallet resounding through the corridors of the dental world, ever carving deeper and deeper into the unknown, trying to throw the true light upon some unsolved problem the solving of which will benefit all mankind. It has not always been smooth sailing with Dr. Johnson. Today the waters lie smooth and his barque is guided easily, but he has been tossed here, there and yonder by the waves of adversity, and it has only been by the utmost willpower, pluck, and perseverance that he has finally emerged victoriously. He has carved his name across the face of old Father Time, where it will remain bright and clear, sparkling as a star which shines from above, where it will remain indelible as long as the word dentistry remains; where it will remain respected, honored, and loved, as long as there remains one respected and honored dentist to love his chosen profession.

Gentlemen, Dr. Johnson has builded better than he knew, and his work will follow him.

Dr. Johnson, in the name of the Dental Society of the State of New York I present to you the jewel that constitutes you a Fellow of this society. Take it, keep it; I know that you can do so with honor to yourself, and in doing so you honor the society which presents it.

Gentlemen, allow me to present to you Dr. C. N. Johnson of Chicago, the newly elected Fellow of the Dental Society of the State of New York. (Applause.)

Dr. JOHNSON, in accepting the medal, said:

Mr. President and fellow members of the Dental Society of the State of New York,—I am very grateful to the president for not having delivered his formal address, because if it had been of the character intimated by him, I can assure you that I would not have recognized myself.

I am very much impressed with that wonderful story he has told you, in which he has done me the honor to indicate in a very delightful way some of the things which he is pleased to intimate that I have done for the dental profession. I wish I could feel in my heart that I was entitled to the illustration of that character, but, sir, I would rather be known as a man who had tried to do a little here and there for the profession I love, and to accomplish something for the welfare of humanity in the service of that profession, than to be the most famous man on the face of the earth. My sentiments this evening are divided between unqualified gratitude and keen embarrassment. I am grateful to the members of this society for the honor they have shown me on this occasion, and I wish particularly at this time to express what I believe are the sentiments of the whole association, when I say that you and I are indebted to the distinguished gentleman who has been the means of giving to you and to me this particular pleasure. I wish it were possible for me to pay to Dr. Jarvie the tribute that he deserves. It is hard to do that in a formal way, because I have just been to dinner with him and do not care to be formal immediately after having dined so very delightfully with him, but I do want Dr. Jarvie to know that on this occasion I am grateful to him as well as to the members of this society.

My embarrassment is occasioned by the conviction of my unworthiness to accept this honor, and my only reason for presuming to permit myself the pleasure of receiving the medal is that, if I have not done anything in the past to merit it, I pledge you my word that I shall try to do something in the future for the welfare of dentistry that may make you feel as an organization that your confidence in me has not been altogether misplaced. I thank you. (Applause.)

The next item on the program was the reading of a paper by Dr. C. N. JOHNSON, Chicago, Ill., entitled "A Consideration of Some of the Present Tendencies in Dentistry."

[This paper is printed in full at page 1102 of the present issue of the DENTAL COSMOS.]

Discussion.

Dr. R. H. Hofheinz, Rochester. I have been both fortunate and unfortunate enough to discuss numerous papers of Dr. Johnson, and I am confronted with the same difficulty today.

It is easy to disagree with a writer and then discuss the disagreement, but it is most difficult to agree with an essayist and discuss the agreement. The most and best anyone can do is either to assume a fictitious attitude or elaborate on the essayist's paper. Not being talented for the former task, I will do my humble share toward elaboration.

The essayist's first subject is that of analgesia. To be totally opposed to any method of some intrinsic value is, to say the least, unscientific: equally as unscientific is it to apply this same method in every instance. A number of us remember well the use of cataphoresis; what a blessing it proved in the hands of the careful operator, and what a curse it became in the hands of the careless. The impracticability of its use was probably the strongest reason why it was discarded with the many utopian methods which preceded it, and this may also be the prime cause why the use of analgesia is growing less. Everybody knows what a craze swept over the ranks of the dentists when cataphoresis was introduced; everyone knows that it made its exit in a very unostentatious manner. Will analgesia fare any better? The old and safe methods, together with the desensitizing paste of Dr. Buckley, are pressing it hard.

Among the numerous deleterious consequences, Dr. Johnson mentions the dangers to patients with high blood pressure. During the discussion on this subject at the Seventh District Dental Society, one gentleman made the statement that a physician was carefully watching the high blood pressure of a patient who was under analgesia, and found it considerably reduced instead of increased. This would neither coincide with Dr. Johnson's views nor with general physiology, and I should be very glad to hear more on this subject.

The danger of approaching too near the pulp during analgesia applies with equal force to any agent that lessens the pain of excavation. Even the best dental anatomist who is more or less obliged to work hastily, and whose attention is drawn away from the painful operation, is apt to make this mistake. In my opinion one of Dr. Johnson's strongest arguments is that "The application caters to the dependence and lack of stamina of the patient." We all know how ready the physician is to administer morphin. The result is that we have probably more morphinists than any other civilized country, and will have them in spite of the stringent law just passed in the State of New York. Our nervous race certainly does not need the infliction of unnecessary pain, but they need the fact emphasized that we cannot go through life as smoothly as we would like to. Every individual must go through a school of hardship which will prepare him for struggles of both a physical and psychic nature, in which analgesia is of absolutely no account. The few isolated cases do certainly not recommend it to all of us under all circumstances. It will find its proper use after it has done enough mischief, and it will then take a proper place among the many dental helpmeets.

Dr. Johnson's next subject is that of prophylaxis. He tells us what he considers conservative prophylaxis, and that seemed to me all there was to prophylaxis, though I have noticed at dental clinics that the operators removed stains with scalers and disks, where dioxid and pumice, together with a little more elbow-grease, would and should have accomplished all conservative prophylaxis.

The essayist waxes eloquent, however, when he speaks of prophylaxis bordering almost on malpractice. He tells us of sandpaper strips being run between the proximal surfaces, lacerating the gums to shreds and cutting into the tooth tissue in the gingival region, of the laying bare of the necks of the teeth by grinding and the use of abrasives. I do not care to open the subject of extension for prevention, which has proved

a blessing in the hands of conservative operators. We know how terribly it was overdone, and how many pulps were unnecessarily sacrificed. I have seen plenty of the latter cases and most violently protested against such dental work, as did Dr. Johnson. I gladly confess, however, that the kind of prophylaxis Dr. Johnson refers to I have not seen, at least not in this section of the country. It would certainly be easier for these gentlemen to bathe all the teeth in muriatic acid; it would help them both physically and financially. The frequent or call it monthly prophylaxis in a healthy mouth, such as Dr. Johnson has described and censured, to prevent all future decay seems as utopian to me as it does to him. He is only too correct when he tells us that the burden of preservation of the teeth is thereby wrongly placed upon the dentist instead of where it properly belongs, on the patient. No gums and teeth can be more perfectly made than those made perfect by nature itself. Not all teeth can be kept free from decay by any amount of prophylaxis. What about sudden changes in the chemical composition of the saliva? What about general diseases and their influence upon the teeth? No amount of prophylaxis can prevent teeth from decaying under such conditions, especially near the gum line, either proximally, bucally, or lingually. I agree with the writer that there is no panacea or absolute preventive for dental caries, excepting to the super-enthusiast or the fool.

Pyorrhea alveolaris is the next subject which is placed under the essayist's critical lens. This subject alone could easily fill three evenings and then show absolutely no signs of exhaustion. Dr. Johnson, however, approaches the subject from the therapeutic side—the emetin and ipecac aspect principally. He is certainly right when he states that "With all the furor in the way of systemic treatment either by the vaccines or by the much-heralded emetin, the chief reliance for the control of pyorrhea must rest with proper local treatment." Of all therapeutic treatments, however, be they local or systemic, ipecac or its active principle, emetin, has thus far to me shown the most powerful influence. The claim for the drug that it will cure all cases of pyorrhea is just as utopian as all other extreme claims. For years we dentists fought for recognition regarding mouth conditions influencing systemic disease. The physicians received us with a superior smile. We are now drifting to the other extreme. Every disease which cannot be easily diagnosed nor readily cured must have its source in dental lesions. Miller in his "Micro-organisms of the Human Mouth," 1898, tells us that Galippe found in the tubules of a tooth attacked by what he termed "infectious arthrodental gingivitis" a parasite designated by the Greek letter η. Subcutaneously injected into guinea-pigs it produced after fifteen days, in the joints of all their jaws, a series of abscesses which made all motion impossible. The parasite showed a preference for the osseous system. Miller tells us that participation of parasites is incidental to the disease. Many reports go beyond the seeming process of Dr. Smith and Dr. Barrett, however.

Recently Dr. Julien Zilz, in the *Zahnärztliche Rundschau,* told us that he made a study of one hundred patients suffering with diabetes and found that in 47.8 per cent. pyorrhea was present. Dr. Evans and Dr. Middleton found the amœba present in every one of the fifty-four cases they examined, and observed marked improvement after the use of emetin in 1/2 per cent. solution in infected sockets. The editor of the *American Journal of Clinical Medicine* tells us that Evans and Middleton found that out of seventy cases of pyorrhea, fifty-two displayed constitutional symptoms, most of them having disturbances of the joints. The great question to be solved is, Which is cause and which is effect? If the endamœba found in pyorrhetic pockets is almost always found in the intestinal tract, and if ipecac in any form is a destructive agent of it, let us use it by all means. It is no new remedy. In connection with intestinal disturbances it has been used in China

for hundreds of years. Only a few days ago, a friend of mine who has lived in China for many years told me that his wife suffered largely from amœbic dysentery, and, in spite of the ipecac, lost all of her upper teeth.

A most serious case of Vincent's angina came under my treatment a few weeks ago. A thorough scaling by Dr. Bradshaw, our specialist, and the administration of alcresta ipecac tablets, 2.10 gr., three times a day, brought about a wonderful result within six or eight days. An equally rapid and remarkable result I saw in the office of my *confrère* only two days ago. I had more negative results than positive ones. This must not discourage us. It only demonstrates how much we are in need of dental scientists.

Root-canal work is the next subject Dr. Johnson touches upon. If ipecac is going to revolutionize the treatment of pyorrhea, the roentgen ray will certainly do the same in root-canal filling operations. It would be interesting to know the percentage of the many unscientific root-canal fillings of cotton, asbestos, etc., which, after many years, show no sign of pericemental complication or alveolar abscess. Only a few years ago some of the greatest scientists resorted to cotton for root-canal filling, evidently with good results. We look askance at the man who does anything of that kind today. Cotton days have passed: root-canal fillings of gold belong to history: gutta-percha cones carried to the apical foramen, and through it, are now in order. Almost two years ago Dr. Gillett read a paper regarding the need of an X-ray apparatus in every office. I was one of the men who opposed that wholesale use, and earnestly believed that dental radiography could readily be done by the general radiographer. Though I am far from being an extremist, I believe today that it is part of a complete dental instrumentarium. It seems as great a folly to extract a tooth when it has lost its pulp as when pyorrhea has attacked it. Both cases are curable, and many radiographs which show a dark outline at the apical foramen do not necessarily indicate pus, though they may indicate tissue changes and even the previous presence of pus to which the disintegration is due. Pus can only be diagnosed by the microscope, and we are only too often willing to jump at conclusions. We, as dentists, are drifting into a danger zone with the physician who may hereafter try to cure all pyorrhea with emetin, diagnose all dark areas of the radiograph, etc. Some of us may not be as skilful as Dr. Rhein in determining the trifle of gutta-percha which has passed through the foramen and becomes encapsulated, yet I would rather take a chance of pumping too much through the root-canal than to preserve the entire tooth in alcohol or in the rubbish barrel.

It would be interesting to have Dr. Johnson explain his method of treating tortuous root-canals with formocresol and zinc oxid. It is true that thousands of root-canal fillings would look like the work of a freshman if radiographed today. We erected many gravestones where we thought we were building monuments of joy everlasting. Dr. Johnson's entire paper, aside from its advocacy of conservatism, advocates what we fought for a long time—namely, the intelligent co-operation of physician and dentist. The physician who undertakes the treatment of diseases of the oral cavity, or any other disorders dependent on pus germs, without consulting the dentist, commits a grave professional error. The dentist who can diagnose pus without taking a culture shows his ignorance. The dentist who has neither time nor skill to treat pyorrhea and does not possess the patience to manipulate root-canals, may well say with Cassius, "The fault, dear Brutus, is not in our stars, but in ourselves that we are underlings." A learned man in our day is a man who knows everything of something and something of everything, but he must be able to do something well and thoroughly.

Dr. C. J. Grieves, Baltimore, Md. Dr. Hofheinz's discussion pleased me almost as much as Dr. Johnson's essay, and I too, like Dr. Hofheinz, find it

difficult to discuss a paper with which I agree, and I can only attempt to emphasize some of the arguments which the essayist has advanced.

Taken *seriatim,* I do not believe the subjects could be more successfully set before us than Dr. Johnson has done, particularly his conclusions about nitrous oxid and oxygen analgesia in regard to systemic dangers and the moral side of the question.

As to prophylaxis, I have gotten myself into trouble with Dr. Hyatt, Dr. Rhein, and also Dr. Fones in regard to the slogan that "Clean teeth never decay," but I think Dr. Kirk agrees with me in the statement that clean teeth, so far as we are able to clean them, do decay. I would like to point out, however, that, while we cannot prevent decalcification of the enamel—which I am not by any means convinced is always decay, although it may lead to decay—because I am a firm believer in the internal secretion theory—we *can* prevent decay of depth and pulp exposure by prophylaxis; and that is a great step. We can prevent periapical infection and pulp exposure if we cannot prevent incipient caries.

It is dangerous to approach the question of pyorrhea at any time, particularly in the present stage of the emetin treatment. Like Dr. Hofheinz, I believe that I have seen results from this treatment. Dr. Johnson has justly emphasized the importance of the work of Dr. Barrett and Dr. Smith. I saw the inception of this work and was fortunate enough to be present when Dr. Barrett presented his first paper. Before the presentation of his paper, Dr. Barrett would not commit himself at all as to which particular endamœbic form was responsible for pyorrhea. A great many factors in the etiology of this disease have not been elucidated sufficiently to furnish a solid basis for claims in regard to treatment, and the same is true with regard to many other pathological conditions. For instance, if the amœbæ are responsible for this condition, it should be possible to make a germ inoculation and produce pyorrhea. This can be done with other pathogenic organisms. I am not questioning the value of this treatment, but I think it should be carried out along the lines suggested by Dr. Hofheinz, in connection with prophylaxis. We must remember that good gingival surgery has cleared up a lot of cases without the aid of emetin, and I have been unable to decide whether it was gingival surgery that improved these cases, or emetin. We have, however, many reports of cases in which there has been improvement in the patient's comfort. Then we should not forget the fact that after we have cleared the mouth of all forms of endamœbæ, we still have the pathogenic germs. If we clear up the endamœbæ, how about the pathogenic germs? Are they not still there?

In regard to pulp conditions or root-canal work, I would only say that I do not want to be classed as a pessimist, as I was this afternoon. I thought I had a cheerful message to bring to you: I thought I would show that there is repair, and I quoted a number of cases in which something had occurred, but I did not know what it was. I thought I was an optimist instead of a pessimist. I believe in the reparative process, and I am opposed to the destruction of teeth on the simple ground that they are defective. I agree with Dr. Johnson entirely that many well-functioning organs are being destroyed and will be destroyed unless the internist can be taught a lesson which, I am afraid, I for one have not been able to drive home. I would like to know how to instruct him; I would like to be able to differentiate all these areas, but I cannot do it. I cannot interpret radiographs in the same manner as some of my friends who have read osteoblast into radiographs.

Dr. Truman W. Brophy, Chicago, Ill. During the reading of the essayist's paper and in the discussion which followed, I tried to arrive at some conclusion as to why there are so many views on this subject. Especially with regard to the latter portion of the paper, which dealt with the pathological side of the

question, I could not reach any other conclusion than that an immense amount of speculation is rampant concerning the etiology of the condition under consideration, and that there has never been formulated a system which would guide the younger men and enable them to make a diagnosis and treat the disease in a scientific manner. In 1903 I read a paper at the meeting of the International Medical Congress in Madrid, Spain, on some of the diseases which medical colleges should teach their students. These diseases were those of the mouth and especially of the teeth, which enable us frequently to trace the cause of diseases elsewhere in the body. If we ask ourselves what we know of the etiology of this condition, which has been given something like twenty-odd names, and which is most commonly known as pyorrhea—to make use of plain terms, pus-flowing—what is pus-flowing? Pus is not a disease, whether it be still or whether it flow; yet in our very defective nomenclature, we speak of the condition which is a sequela of disease, and not in any sense a disease. We must correct our nomenclature in this respect.

What is the reason that we cannot reach a conclusion? There are nearly as many different opinions about this condition as there are men to give opinions, and that suggests to me that there is something wrong. We must conduct experiments in our laboratories, and these experiments must be conducted by men capable of solving these problems. How many years has it been since Dr. Riggs first discussed this inflammation of the dental alveoli, which was then known as Riggs' disease? Far better would it have been to have that name retained than to have it confused with twenty-odd names. We have many diseases known by the names of the men who first described them, like Addison's disease, Bright's disease, etc.—then why not call this disorder Riggs' disease?

By far the most important factor in connection with this matter will be the co-operation of the medical faculties everywhere and their willingness to teach their students dental pathology so far as it relates to the diseases which manifest themselves elsewhere in the body. I regret to say that, as you all know, the average medical student is not capable, not through his own fault, but because he has not had the opportunity to learn how to make a differential diagnosis between any of the simplest discases that pertain to the teeth and the tissues about the teeth. He does not know the difference between sensitive dentin, pulpitis, incipient dento-alveolar abscess, etc., and now that many medical men are learning that the teeth frequently cause neuralgia, nephritis, gout, arthritis, etc., they have gone back to the opinion held when I entered the profession—namely, that if anything was wrong with the teeth they should be extracted. Now they have gone back to that position, and, as the essayist and Dr. Hofheinz have said, they are not progressing; there has been a wonderful retrograde movement on the part of the men engaged in the treatment of human ills in their advocacy of the destruction of that which they cannot cure. I look upon this condition with deep regret. We are approaching a crisis, and there is, in my opinion, but one course that should be encouraged and followed most faithfully; and that is, to solicit the co-operation of medical teachers and induce them to establish in the schools departments in which the students may obtain knowledge of these conditions which are so important. I was extremely sad a short while ago when a celebrated pathologist declared that the men who were extracting teeth and making dental plates were safer practitioners for the public than those who were endeavoring to preserve them. Such opinions, coming from prominent men, are a calamity to the human family. Such doctrines should not be promulgated, but we are helpless as long as medical students are taught nothing about dental pathology.

I think the essayist and the speakers who followed him have given us many valuable suggestions worthy of careful consideration. While we are establish-

ing this great movement for original research work, let us do something to stimulate an interest on the part of teachers and get them to prepare the young men for the work that is before them. I claim that the branch we are dealing with tonight is a part of medical science. Is any one of our medical schools teaching the healing art in all its branches? No. Let it be the aim of the dental profession to take this matter up with the medical faculties, and let some of these bright young men whom I have heard speak here today give a course of lectures in these schools and teach the medical students how to make a differential diagnosis of the many diseases that exist in the oral cavity and to treat them in a scientific manner, so that there will not be many methods of treatment, but one definite plan to be followed with as much accuracy as the modern treatment of appendicitis. Physicians do not have a half-dozen different ideas of appendicitis; they know how to diagnose and treat it, but when it comes to diseases of the mouth, there is a marked difference of opinion. There should not be a difference of opinion on a subject like that; we should have well-defined plans for making a diagnosis, and well-defined courses of treatment. There are divisions and complications, of course, which need special attention, but the general conditions and their treatment should be understood. There should not be *many* ways; there is only one right way, and the rest are wrong; there should be principles laid down upon which practice should be conducted.

Dr. JOHNSON (closing the discussion). I am profoundly grateful to the gentlemen who have taken part in the discussion for the consideration they have shown this evening.

Dr. Hofheinz makes the statement that he was not familiar with the kind of prophylaxis that I mentioned in the paper, and I think the idea may be in the minds of some that I have erected a man of straw and knocked it down. I shall, therefore, again describe the kind of prophylaxis advocated in certain sections, which consists in grinding away all the anatomical markings of a tooth, whether it be decayed or not. For instance, the sulcus in the occlusal surface of a molar is ground out, and the surface made smooth by some prophylactists. We have on the lingual surfaces of the upper incisors a little projection of enamel placed there by nature; that is ground off, and the surface of the tooth made smooth, no matter how far the grindstone has to go. At the gingival region of every tooth they use a strip of sandpaper and saw back and forth. No matter if the enamel is thin at that point, the surface is made smooth and polished, and every tooth in the arch is treated that way. Such methods I am decidedly opposed to, and would call them criminal malpractice. These methods are being practiced in some sections of the country, and patients are frequently made uncomfortable thereby. I admit that such a procedure will bring about improvement in the tissues surrounding the teeth in many mouths, and that the improvement may be apparent for some time, but I am looking to the future, and I will never countenance any dental treatment in my patients that I would not advocate in my own family.

Dr. Hofheinz has asked me to go into a discussion of the treatment of tortuous root-canals, but I feel that we have had enough of the treatment of pulpless teeth at this meeting, and as I went into that subject somewhat carefully in my paper last year, I shall, with your permission, dismiss this topic for the present.

I wish to say a word about Dr. Grieves' discussion. I have been greatly pleased with his statement in relation to medical men, in which he intimated that they have issued to us a challenge that we help them in eliminating certain diseases, and he was modest enough to say that he was not able to meet that challenge in all respects. Dr. Grieves has done more to add to our knowledge in this respect in the past few years than almost any man I know. He has gone into the subject in a scientific way, and

I will not acknowledge, as he has done in his modesty, that he is unprepared to meet this situation. He is prepared to meet medical men on an equal basis and throw light upon these afflictions that are affecting the human family; he is able to meet the medical profession and consult with them intelligently on these questions; and that is what every dental practitioner should equip himself to do. We shall never redeem ourselves in the eyes of the medical profession or the world at large until we follow Dr. Grieves' suggestions regarding the relationship between apical infections, for instance, and systemic troubles.

We are going right ahead in research work, and I feel, as one gentleman said in regard to Dr. Gies' paper, that we should support dental research work. I heard a medical practitioner say, when he learned that dentists had raised a fund of forty-five thousand dollars for research work, that it was the most magnificent news he had ever heard, and he did not believe it was possible to raise a similar amount of money in any body of medical men to prosecute a similar research. Yet it is not so much the work that is being done by these committees that is going to do the greatest good for the greatest number; the greatest good is to come from the individual member of the profession who goes into his study and devotes time to the consideration of the problems that he meets in his practice. The statement was made by the president of the Illinois State Dental Society that the professional man's career was made or marred in the hours after dinner. What you do in your studies at night, is going to hasten the uplift of the profession. It is these combined efforts of the research committees and of the individual dentist who is a close observer and is able to apply the subjects studied in his laboratory to his practice at the chair that are going to elevate the profession. Our profession has been charged with a lack of scientific interest, and now most decidedly we must prove that we are students, and then, when the time comes, we will be able to meet the challenge of the medical man and be able to consult with him on common ground.

I wish again to express my deep gratitude for the reception you have given me at this meeting.

The meeting then adjourned until Saturday morning.

SATURDAY—*Morning Session.*

The meeting was called to order Saturday morning, May 15th, at 10 o'clock, by the president, Dr. Wright.

The first order of business for the morning session was the reading of the report of the Law Committee.

Dr. BEACH moved that the reading of the report of the Law Committee be dispensed with. (Motion carried.)

The next order of business was the reading of the report of Council, by the secretary of the Council, Dr. G. B. Beach.

Dr. BEACH moved that the report be adopted. (Motion carried.)

The next order of business was the installation of officers, after which Dr. A. P. Burkhart moved that the society adjourn to meet in Albany on the second Thursday in May 1916.

Motion carried, and the society then adjourned.

CONNECTICUT STATE DENTAL ASSOCIATION.

Fifty-first Annual Convention, held at Hartford, Conn., April 20 to 22, 1915.

(Continued from page 1053.)

WEDNESDAY—*Afternoon Session.*

(Continued.)

The next item on the program was the reading of a second paper by Dr. MAX R. SMIRNOW, entitled "The Germicidal Properties of Dental Cements."

[This paper will be printed in full in the November issue of the COSMOS.]

The afternoon session then adjourned.

WEDNESDAY—*Evening Session.*

The meeting was called to order by the president, Dr. Riggs, at 8 P.M. on Wednesday, April 21, 1915. This session and the Thursday morning session were given over to the annual meeting of the Connecticut Dental Hygienists' Association, as joint sessions of the two associations.

Dr. Riggs introduced Mrs. Irene Newman, Bridgeport, president of the Connecticut Dental Hygienists' Association, who presided during the session of the Hygienists' Association's meetings.

Mrs. Newman then delivered her annual address to the association, as follows:

Connecticut Dental Hygienists' Association—President's Address.

By Mrs. IRENE NEWMAN. Bridgeport, Conn.

Ladies and gentlemen.—It is our desire first of all to extend to the officers and members of the Connecticut State Dental Association our sincere thanks and appreciation of their courtesy in permitting us to attend their convention, and also for the generosity they have so kindly shown in giving us a portion of their time in order that a part of the meeting of the Connecticut Society might be devoted to mouth hygiene and prophylaxis.

This meeting marks an epoch in dentistry, for, as far as we know, it is the first dental meeting where an organized body of women, who have been educated and trained to work as prophylactic operators under the dental surgeon, have met in joint convention with dentists. It is our desire to make our services so valuable to the dentist, as well as to the public at large, that the Connecticut Dental Association will have no cause to regret having thus honored us.

The Connecticut Dental Hygienists' Association was organized on June 6, 1914, in Bridgeport, and started with twenty-seven members. In January 1915, another meeting was held, also in Bridgeport, and additional members admitted, making a total at that time forty-six members. We feel that we have the nucleus for a large organization, and that when the importance of our work is fully realized we will have the aid and co-operation of many women who will become associate members, and help us to advance the cause of mouth hygiene in our public-school system. We hope especially to interest the wives of the dentists throughout the state in this work, feeling that their influence would be very helpful in starting school clinics and in interesting the public in behalf of the children.

We know that our services as prophylactic operators in private practice are

exceedingly valuable to the patients as well as of great assistance to our employers. The proper preparation of mouths for examination and for operations as a necessary procedure in dentistry is being realized more and more, and also the maintenance of cleanliness and health after a mouth has been put in order. No one can, at the present time, predict how far-reaching our work may prove to be in the prevention of infectious diseases, but we are confident that, in the next few years, there will be no question concerning the value of our service. Our annual conventions should prove very helpful to us in increasing our knowledge pertaining to our work, from the mutual interchange of ideas, which is always helpful, and from talks of educators with which no doubt we may be favored, that will greatly aid us in becoming more and more enlightened.

We hope that our convention will be of much interest to all advocates of mouth hygiene. Prophylaxis in private practice will be discussed, and a full description of the preventive dental clinic in the Bridgeport public schools, including numerous lantern slides, will be given by the supervisors of the clinic.

We are to be greatly favored this evening by two prominent essayists from New York who are specialists in orthodontia, Dr. J. Lowe Young and Dr. Milo Hellman. Although prophylaxis in private practice is exceedingly important, yet the prevention of disease and the physical and mental betterment of the children by the type of preventive and educational clinic established in the public schools of Bridgeport seems to be most unlimited. It is our belief that in less than five years this form of clinic will be adopted quite generally by all progressive cities. This means that there will be a great demand for the dental hygienists, and the problem to be solved in the near future will be that of the establishment of schools where they may be trained. As an association it will be our endeavor to advance the standards of educational requirements for the dental hygienists of this state as soon as the time seems propitious. In the meantime our state organization will do all in its power for the mutual improvement of its members.

We welcome you all to this our first convention, and trust that our meeting may prove to be of interest and benefit to you.

Dr. R. H. W. Strang next introduced the essayist of the evening, Dr. J. Lowe Young, New York, as follows:

Dr. Strang. *Mr. President, members of the Connecticut State Dental Association, members of the Connecticut Dental Hygienists' Association, and guests,*—Before introducing the essayist of the evening, it has been suggested by our president that the speaker digress from his task long enough to explain to the members of the association just who the Dental Hygienists are, and what their work is to be.

Last year, in Bridgeport, an opportunity came to establish dental treatment along preventive lines in our public schools. Such an opening not only created a demand for a corps of trained women who could be placed in the schools to do such work, but, more important than this, a need of specially trained women who were capable of acting as supervisors over such a corps.

To meet this exigency an educational course was inaugurated by Dr. A. C. Fones for the purpose of training such supervisors. Thirty-one women were enrolled and the course continued from October until June, during which time fifty-one lectures were given and two months of practical work taken.

These young ladies upon being graduated were termed "dental hygienists." The word "hygienist" was chosen in preference to "nurse" because these women will not deal with disease conditions as does the nurse, but their work in life will be to maintain healthy oral structures by preventive treatment.

It is the graduates of this school who have formed themselves into the organization that meets with us this year, and bears the name of the Connecticut Dental Hygienists' Association.

The work of the dental hygienist divides itself into two types. First there is the "institutional work" carried on in the public schools, hospitals, sanatoriums, etc.; second the work in private or office practice, *i.e.* as operators in offices of dental practitioners.

That these young women have come into definite and fixed relationship with dentistry there is no question. We believe that they offer the one solution to our school-children problem, as we hope to convince you all later; furthermore, the demand for their services by the public will force us to welcome them to our offices. Therefore it is most fitting that their association should meet with us in annual session, and we bid them hearty welcome.

The paper of the evening comes as a result of the work of the dental hygienists in our schools. In the examination of about 4500 children in the first and second grades of the schools, 26,000 cavities were found in the deciduous teeth. When these examinations were made, slips were sent to the parents suggesting that the child be taken to a dentist for attention, and it may seem astonishing to you, as it did to us, to know that in many cases the children came back with the statement from the dentist that these teeth were not worth saving; that they were temporary teeth, would soon be lost, and therefore it was time wasted to bother with them. I say this not to criticize any dentist, but to impress the fact that somehow there has been a failure in educating many within our ranks to a realization of the importance of the temporary teeth. That this subject might be forcibly emphasized, the committee has endeavored to place on the program men who are in a position to see the mal-effects of such tooth loss, and hence can speak with the greatest authority. We trust that they will present this subject tonight not from the viewpoint of the orthodontist, but from the broader conception of its relation to the development and growth of the child. It is to be hoped that this message will take deep root in our minds and thus become a permanent influence in our future relationship to these important organs.

It gives me great pleasure to introduce Drs. Young and Hellman of New York, who, with our own Dr. Crosby, will discuss this problem.

Dr. Young. *Mr. President and members of the Dental Hygienists' Association, members of the Connecticut Dental Association, ladies and gentlemen,*— It affords me very great pleasure to be present at this meeting, particularly as I believe it to be one that marks the beginning of a new era in dentistry. I think it is very fortunate for the profession of dentistry, but more fortunate, I would say, for the residents of the State of Connecticut, that this joint meeting is being held. I think it shows very liberal support on the part of the dental profession of this state that they consented to this joint meeting, and I, being of an optimistic disposition, can see nothing but wonderful success in the future from the movement that has been started here. It will be a very great surprise to me if every state in the Union in a very short time does not fall in line with the movement that has been started here. In treating the subject which has been assigned to me, I have made a short synopsis, after which I will show a number of lantern slides to demonstrate the importance of the temporary teeth to the growth and development of the child.

Dr. Young then read his paper, entitled "The Importance of Sound Temporary Teeth to Facial Growth and Development," as follows:

The Importance of Sound Temporary Teeth to Facial Growth and Development.

By J. Lowe Young, D.D.S., New York, N. Y.

It is assumed that everyone will concede that there is a definite relation which the teeth of each dental arch should bear to one another and also to the teeth of the opposing arch—a relation known as normal occlusion. This does not imply that every set of human

teeth in this relation is identically the same. The development of these normal conditions necessitates pronounced changes in the organism.

The deciduous denture comprises twenty teeth, ten in each arch. Like the permanent teeth, they should stand in a definite relation to each other and to those of the opposing arch. Their eruption extends over a period of from one and a half to two and a half years. When complete, they should be in contact with each other.

It will be observed that a pronounced facial change takes place during this period; the baby's face has been lengthened and carried forward so as to assume the beautiful, pleasing face of the child. No doubt we all have noted many cases where children of our acquaintance at this stage of development were very pleasing in appearance; but later on they became quite "plain-looking" if not homely, which in my opinion is due to lack of normal development of the dental arches.

From the completion of the deciduous denture until the appearance of the first permanent tooth there is a lapse of from three to four years. This does not imply that there is no change in the deciduous denture during this period. If normal development continues, the dental arches expand, and spaces are observed between the incisors. These spaces have never been observed to appear in cases where the deciduous molars have not been used in a vigorous manner. This also caused a facial change, resulting in a broadening of the face and an increase in the size of the mouth.

Unfortunately all children do not proceed along these lines, but I think it safe to state that the percentage of malocclusion of the deciduous denture at three years of age is very small in comparison to that of permanent dentures.

Between the fifth and eighth years, the first permanent molars, the corner-stone of the teeth, should appear. There are four of these, one on each side of each dental arch, directly back of the last deciduous molars. Owing to the fact that the laity assumes that the child should erupt his first permanent tooth in front, as in the deciduous set, thousands of these teeth are neglected until the fissure cavities have become gaping caves, frequently with exposed pulps, which in the majority of cases means that they will sooner or later be condemned to the forceps.

These first molars are almost always found to be in actual contact with the distal surfaces of the second deciduous molars, and during their eruption there is a further forward movement of the dental arches, and likewise a lengthening of the face.

From the above it will be observed that it is most important that the deciduous teeth should be so cared for that their function shall not be interfered with in the least; also that cavities in their approximal surfaces shall be filled so as to maintain their entire mesiodistal diameters, and above all that these teeth shall not be lost prematurely.

When deciduous molars are prematurely lost, it is very advisable that the space should be maintained by some mechanical device. This is particularly necessary if the loss has occurred prior to the normal locking of the first permanent molars.

(Dr. Young showed in connection with his paper a large number of slides illustrating various irregularities occurring in children as the result of neglect of the deciduous teeth.)

Discussion.

Dr. Milo Hellman, New York. The essayist has taken his point of view on the treatment of the topic on hand so aptly that there is little to dispute and less to be adduced in confirmation of the important and valuable arguments brought forth. Though there may be some reason for contention in a few minor details, I shall, for the benefit of the whole, desist from any dissension, that I may not leave an impression of caviling. In order, however, to impress upon you the importance of this

evening's topic, I will with your kind indulgence approach this subject from a general biological aspect.

The relationship between the teeth and the organism in general is of such an intimate character that it is not at all extraordinary to observe the reflections of certain constitutional disturbances upon the dental organs. The defects of the teeth due to hereditary lues, tuberculosis, or rhachitis are generally known, as are also those due to acute infectious diseases, such as diphtheria, scarlet fever, and measles. Every deleterious influence, especially during the period of development of the dentition, will naturally have its effect upon it, be it during the embryonal period, after birth, or even up to puberty, when the roots of some of the teeth are not quite completed. It is reasonable, therefore, to assume that the deciduous dentition is subject, during the entire period of its existence, to the continuous influences of numerous disease processes, and requires extreme care and observation even under the best constitutional conditions. The deciduous dentition, though a transient organ, makes its appearance during a period in the development of the individual when the entire organism is in an unbalanced state. The conditions under which this organ is completed and maintained will leave indelible marks upon the succeeding dentition and its intimately related parts. As the most important and most commonly observed disturbances may be mentioned those of the functions of mastication, respiration and speech, and facial expression.

Function and structure are inseparable phenomena. So intimate is their inter-relationship that the question of their precedence would appear to be an open one. Although function is usually observed first, it may readily be assumed that it is but an expression of a structure which may be even in course of its development. The perfection of function, therefore, depends upon the normal development of the structure. With the transition from the nursing infant's dependence upon the mother's breast to his independence in nutrition, the primary masticating apparatus is completed, comprising, of course, the dental arches, the muscles of mastication, and the secretions of the salivary glands. It depends, therefore, upon the condition of these structures whether the function will be normal. As was said above, the period of development of these structures is that of an unbalanced organism, and with the digression from normal of any of these structures there will be a corresponding deviation in function. Furthermore, as during this early period in development the individual presents a very fertile soil for habit-forming tendencies, it may readily be appreciated how a sensitive tooth cavity and inflamed mucous membrane, a disturbance in a salivary gland or a "tired" or weak masticatory muscle may influence the habit of mastication. As a result of such conditions, we may have habits established where all the food is masticated on one side of the mouth only, or where the food is masticated in the front part of the mouth or not masticated at all but simply bolted. Thus, while physiological stimulation enhances normal growth, and furthers hygienic conditions, lack of function may act as a cause producing unhygienic conditions and disease of the structures involved.

Respiration, again, depends upon two important conditions, viz—first, a clear nasal passage, and second, normally occluding teeth. The teeth, as has been shown, besides being subject to dental caries, are also subject to such a form of malposition as to interfere with respiration. In order that the mouth may be kept normally closed, it is essential that the dental arches come into such relation as to permit the tongue to rest with its dorsum against the roof of the mouth, and permit the lower lip to cover the labial surface of the incisal third of the upper incisors and canines. In a case of malocclusion belonging to class II (Angle), it will be seen how difficult it would be to place the lower

lip over the edges of the upper anterior teeth. And unless this condition is fulfilled, the mouth cannot be kept normally closed. This explains the reason of the contention, so often repeated, that the child has had his adenoids removed and yet continues to breathe through the mouth.

Coincident with the development of the function of mastication another important function makes its appearance, a function which is so important that it serves to distinguish the human being from the rest of the animal kingdom, and that is the function of speech. The relationship of this function to the development of the deciduous dentition is far more significant than is generally conceded. But if it be recalled that both speech and dentition go on developing harmoniously and contemporaneously, and that a disturbance in one is very often accompanied by a disturbance in the other, it may be realized that there exists an intimate relationship between the two. Furthermore, if it be remembered that a number of sounds of our speech depend upon the position of the teeth, it may be seen how defective these sounds may become in certain forms of malocclusion. The sound "s," for instance, is pronounced by bringing the incisal edges of both upper and lower incisors almost to touch, and placing the tip of the tongue on the lingual side of the lower central incisors, while the sound "sh" is pronounced by just changing the position of the tongue from the former to above the upper incisors on the palate, keeping the incisors as before. Now, how could one produce these sounds correctly with a mouth representing a class II or class III malocclusion or with a mouth having an open bite?

Disturbances of speech, due to dental malpositions, therefore, should command immediate attention, for, once habitually acquired, they present problems with which the most skilled are unable to cope.

As regards facial expression in relation to the teeth, the following description by Schwalbe will convey an adequate idea:

Thus the most striking change in the head taking place from birth until the end of childhood is found in the face. Even to those who observe these phenomena not from a medical point of view, this change is the most significant of the entire body. The face reflects intellectual life; the development of intellectual life finds expression in the facial change.

The first change in the nursing baby gives the countenance a greater fulness, and produces the characteristic appearance of the infant face. At birth, the forms are less full, while in healthy infants during the middle of the first year, their round face, with their round cushionlike cheeks and large eyes, is normal. Furthermore, the growth of the facial portion of the head is more rapid than that of the brain portion, especially after the first year; above all, the erupting teeth and the accompanying enlargement of the jaw-bones give the face a different expression. As the facial expression is decidedly influenced in infancy by the eruption of the deciduous teeth, so it is again in childhood the transition from the deciduous to the permanent dentition that produces a change in the facial expression. Of course, this is a slower change, taking place more gradually than that first described.

Stratz says that—

Just as the growing of the milk teeth enlarges the jaw-bones and with them the lower part of the face, producing at first a fulness from the typically toothless nursing infant, in a similar manner, but in a higher degree, the features are markedly longer, more definite, and stronger. The lower jaw becomes more powerful, its angles are more definitely marked, the round, soft mouth is lengthened, the nose becomes more prominent, the cheeks assume no more the position of small globes below the eyes, but disappear gradually, and flatten out about the increasing width and length of the chin and mouth portion. As the growth of the brain-case and eyes is much slower than that of the face, the eyes are apparently continually rising, and the head seems to diminish in size as compared with the face. Besides this, and owing to the lateral gain in the jaw portion, the eyes seem to approach each other more and more. This difference also is only apparent, for the distance between the pupils changes very little during the entire life. . . . Although the transformation of the child's face to that of the typical girl or boy is very gradual, there is, during the change of the dentitions, a marked exacerbation in this process.

In conclusion we may say, therefore, that in the study of the human deciduous dentition we must always remember that besides constituting an organ for the performance of a fundamental vital process, namely, the function of mastication, it also involves the process of respiration; it helps to perfect one of the functions which place man at the head of the animal kingdom, namely, speech, and assists in giving expression to the moods governing human emotion.

It is therefore of inestimable importance that during ministrations to the human mouth the operator shall not only have a clear conception of the normal condition of each individual tooth, any aberration from which it shall be possible to judge, but it is equally essential to possess a definite knowledge of the masticatory apparatus as a whole. For the fate of a part is primarily a function of its organization, and secondarily a function of its position.

Moreover, as all these phenomena begin their manifestations during the period of and coincident with the deciduous dentition, we may not be wrong in maintaining that the normal development of the latter may exert an important influence in the perfection of the normal human being.

Dr. A. W. Crosby, New Haven, Conn. In my few remarks I shall try to emphasize perhaps more forcibly some of the points Dr. Young has mentioned in his synopsis. In the first place I was much impressed with the fact that the spaces did not develop between the temporary incisors when the molars were not properly used. In addition, there are frequently cavities in the approximal surfaces of these molars which have a tendency to allow these teeth to come more closely together than they should, and further lessen the space which the bicuspids are to occupy when they are erupted. In this case, gutta-percha fillings should be placed in these approximal cavities, whereby after a few months sufficient space will be obtained. If this space is to be maintained for a number of years, amalgam, or some permanent filling material covered with amalgam, will serve the purpose very nicely.

Another point that appealed to me in the essayist's paper was the fact, so beautifully shown in the slides, that the development of the permanent teeth is due largely to their use. I recall the case of a child whose deciduous teeth on one side did not occlude, and that side of the face did not develop in symmetry with the other side. The asymmetry was very marked, and later we expanded the arches and brought these teeth in contact, and encouraged the boy to masticate on that side almost entirely. As a consequence, the development on that side soon came up to normal. Dr. Lawrence Baker of Boston made some very interesting experiments that showed the effects of use and disuse of the teeth, by grinding off the teeth of rabbits on one side and forcing the rabbits to masticate on the opposite side. This proved very conclusively that use and disuse are quite important factors in the development of the arches and surrounding structures.

In cases where teeth are allowed to break down, especially when fistulæ are formed and pus is discharged into the mouth, there is very likely to develop an infection in the region of the tonsils, followed by adenitis, and often we find, as the result of swallowing of more or less pus, various kinds of rheumatism, especially that of the inflammatory type. Infections of the tonsils are now being looked after very closely. Recently at Johns Hopkins University in Baltimore I saw their tonsil and adenoid work, and was rather pleased to find that the patients are referred to the dental clinic before any operation is performed on the tonsils. They believe that it is absolutely necessary to put the mouth in as sterile a condition as possible prior to any operation on the throat. Heretofore it has frequently been the practice to remove the tonsils without any attention to mouth conditions, and many bad cases of sore throat following tonsillar operations have been attributed directly to conditions of the

mouth and teeth, especially when fistulæ are discharging into the mouth. Many diseases reach the system through the mouth, and when the teeth are badly broken down, the micro-organisms have a chance to develop. It is not especially during the period of eating that the germs get into the system to do harm, for during that period the gastric and intestinal juices have a tendency to protect the tissues from germ action, but during the period between meals, when there is nothing to resist the action of bacteria, they can easily get into the system. Such diseases as pneumonia, disturbances of the digestive tract, adenitis, and certain types of rheumatism have their origin largely and almost entirely in the mouth, in direct proportion to the unhygienic condition that exists there. Dr. Osler, in a lecture delivered at Yale University the winter before last, said that the foundation of the particular trouble that was to prove fatal to a person was laid before the age of nine years, which statement certainly must impress us with the importance of carefully watching children during this developmental period. Besides, of course, we appreciate the fact that development being dependent upon use, makes for beauty and for symmetry.

In closing I wish to quote a paragraph from "V. V.'s Eyes:" "With one-half the world only, as all know, is character destiny. The rest is bent or twisted, glorified or smashed, by physiognomy, the great potter."

Dr. F. T. Murlless, Jr., Hartford, Conn. I would like to offer a word of commendation to Dr. Young and to express to him my appreciation of the way in which he has presented scientific facts which are difficult indeed to convey without being tedious. The things that are hardest to tell are often the things which have very little sparkle in them.

Dr. C. H. Gerrish, Exeter, N. H. It has been stated that it takes sometimes six months to correct an irregularity; in the early days of this practice it took sometimes six years with the old-fashioned appliances we had to use.

In regard to fillings in children's teeth, it has been my practice for many years to use gutta-percha, and where there are approximal cavities, I extend the gutta-percha from one cavity to the other, connecting the two cavities solidly, in that way preventing further decay, also keeping the teeth properly apart.

Dr. A. C. Fones, Bridgeport, Conn. I wish to express my appreciation of Dr. Young's and Dr. Hellman's splendid presentation, and commend Dr. Crosby for the way in which he has emphasized some points which I consider very essential.

In our work in the public schools we have been amazed at our findings as to the condition of the mouths of the children at the ages of five and six years. With such mouths, with dozens, I might say, of cavities, with food decomposing in them, abscesses, etc., it is a wonder to me that the children are able to go to school at all. In sending these children to dentists we found that some practitioners told the parents that these were only deciduous teeth, that they were lost in a short time, and that it was money wasted to give any attention to them. The result is that the child's mouth is a source of very serious infection; it is an ideal incubator for bacterial life. There is serum oozing from the border of the congested bleeding gums, making an additionally favorable medium for pathogenic bacteria.

What we want the dental profession to appreciate is, that when these children come under their care with one single cavity of any kind in a temporary tooth, it is necessary to fill such a cavity not only in order to save the child's face from deformities, such as Dr. Young has portrayed, but to save the child from possible systemic infection by eliminating this incubator with its decomposing food, and possibly dead pulps, abscesses, etc. Another factor which the dental profession should appreciate is that from birth to the twelfth year the temporary teeth perform a more wonderful function in the development of the body than the permanent teeth do for the rest of the child's life. If a child has a per-

fectly sound body at twelve years of age, has a clean mouth and proper habits, and knows how to masticate his food, the rest of his life will take care of itself. It is difficult to undermine the human system if perfect care is taken of it up to the age of twelve or fourteen years.

The importance of the temporary teeth has been beautifully portrayed tonight, and I hope that the dental profession of Connecticut will appreciate this fact, and when children come into their hands will see to it that every cavity is properly filled.

Miss HOUSE moved that a vote of thanks be extended to Dr. Young, Dr. Hellman, and Dr. Crosby for the helpful and instructive presentation of the subject of the importance of the deciduous teeth. (Motion carried.)

Mrs. Newman then appointed as the Nominating Committee for the Hygienists' Association Miss House, Miss Frederick, and Miss Sinclair.

Motion was then made and carried to adjourn until Thursday morning.

THURSDAY—*Morning Session.*

The meeting was called to order by the president, Dr. Riggs, at 10 o'clock, Thursday morning, April 22d.

The next order of business was the report of the Legislative Committee, by Dr. FONES.

The secretary, Dr. Bryant, read a letter from the Governor of Connecticut, Hon. M. H. Holcomb, sending greetings to the society.

The Secretary also read letters from the president of the National Dental Association, Dr. Gallie, and from the secretary, Dr. King, inviting the members to the coming meeting of the National Dental Association and Panama-Pacific Dental Congress to be held in San Francisco in August.

Dr. SEARS moved that the letters be acknowledged by the secretary and that the greetings and good wishes of the society be sent to the president and secretary of the National Dental Association. (Motion carried.)

The next order of business was the report of the Nominating Committee, as follows:

President—Arthur V. Prentis, New London.
Vice-president—T. A. Ganung, Bridgeport.
Secretary—E. R. Bryant, New Haven.
Treasurer—B. A. Sears, Hartford.
Executive Committee—G. S. Leonard, W. J. McLaughlin, and G. C. Fahy.
Librarian—L. L. Beach, Bristol.
Editor—O. T. Rule, Stamford.

Dr. FONES moved that the rules be suspended, and the secretary be instructed to cast one ballot for the society for the list of nominations for officers for the ensuing year. (Motion carried.)

The newly-elected president, Dr. A. V. Prentis, New London, was then installed into office, and assumed the chair.

Motion was then made and carried to adjourn.

Connecticut Dental Hygienists' Association.

THURSDAY MORNING.

The second session of the meeting of the Connecticut Dental Hygienists' Association was called to order on Thursday, April 22d, at 10.30 A.M., by the president, Mrs. Newman.

Mrs. Newman announced as the first item on the program for the morning session, the reading of a paper by Miss A. K. MOORES, Stamford, Conn., entitled "Prophylaxis in Office Practice from the Viewpoint of a Dental Hygienist." After the reading of the paper it was discussed by Miss Carolyn Frederick and Miss C. Louise Harris.

The next item on the program was the reading of two papers—by Mrs. HUBERT W. HART, Stratford, Conn., entitled "Working Out the Details of a Preventive Dental Clinic for School Children," and by Miss ROSE E. HOUSE, entitled

"Work of the Preventive Dental Clinic in the Bridgeport Public Schools."

[These papers are printed in full at pages 1127 and 1133 respectively of the present issue of the DENTAL COSMOS.]

Discussion.

Dr. E. S. GAYLORD, New Haven, Conn. The essayists have furnished us with a text on which we might consume hours in discussion, and in words of admiration and encouragement to increase interest in this subject. I recognize the fact that you have occupied your time admirably, and I think all present are ready to concede with me that these young women have presented to us today an entirely new phase of our practice. We have not realized the position we are occupying in our offices, but these young women have told us, in words which we cannot forget. We will, of of course, do our best to obtain in the future the benefits which have been pointed out to us.

There is one thought that I would like to leave with you today, and that is, that you young women of this class, the first class of graduate dental hygienists in the world, are making history, and you are extending the reputation of this noble state of ours, which has never yet been in the background in furnishing men and women of sufficient ability to take their proper places among the other states and in the world at large. Your names will be emblazoned upon the panel of fame for all time, and our State Society may well be proud of the reception extended to this noble band of coworkers in a joint annual meeting. May this condition continue, as I believe it will, from today until the end of time, and no man can conceive of the great blessings and benefits that may arise from this great work for humanity.

Dr. F. J. ERBE, Waterbury, Conn. I realize that it has been very difficult to induce the municipalities to do something in the way of taking care of the teeth of school children; it has been a very difficult matter to work out a system whereby oral hygiene could be handled successfully, and I am indeed very glad and grateful to the man who originated this idea of training young ladies to do this work. The profession at large owes to Dr. Fones a debt of gratitude for starting this work in this way, and I feel that this is a practical way of dealing with this question. We all recognize the fact that there are not enough dentists in the country to do the work necessary in this direction. I understand that if all the necessary dental work of New York city were done, there would not be enough dentists in the United States to do that work alone; so we can readily realize what an enormous field there is for such work as we have seen today. The idea of these hygienists going to the schools instead of having a central point and having the children come to them is, I think, a good one. Only yesterday I was speaking to a gentleman who has had considerable experience in a large central clinic, and he said that it was a difficult matter to handle the problem in that way, and there was considerable dissatisfaction, due to the fact that teachers from the different schools were bringing children to the clinic in large numbers. When these large groups of children arrived at the clinics, the operators were too busy to see them all, and they had to be given an appointment for another day, which meant that they had to make two visits in order to get their work done. So I think the method of going to the schools and seeing the children there, taking them away from their school work only a short time, and doing the work in a systematic manner, will prove the value of the system and also the value of the preventive treatment that has been outlined to us so clearly this morning. I believe that in this way we will be able to take the next step which Dr. Mayo has said the dental profession must take in the field of preventive medicine.

The president, Mrs. Newman, announced that in the afternoon Dr. Fones would demonstrate the method of instrumentation used in polishing and cleans-

ing the teeth, as taught to the dental hygienists.

The meeting then adjourned.

In the afternoon Dr. A. C. Fones of Bridgeport presented, with the aid of the stereopticon, the complete system of instrumentation and polishing for prophylaxis, assisted by ten dental hygienists, who demonstrated practically on patients each division of instrumentation and polishing as they were described from the views on the screen. Those who assisted Dr. Fones in his demonstration were Miss Sinclair, New Haven; Miss Lassen, New Haven; Miss Champagne, New Haven; Miss Russell, Stamford; Miss Birdsall, Hartford; Miss Reilly, Bridgeport; Miss Cortright, Bridgeport; Miss Frederick, Bridgeport; Miss Rich, Waterbury; and Miss Hubbell, Waterbury.

ACADEMY OF STOMATOLOGY OF PHILADELPHIA.

Regular Monthly Meeting, held May 25, 1915.

The regular monthly meeting of the Academy of Stomatology was called to order Tuesday evening, May 25, 1915, at eight o'clock, by the president, Dr. J. C. Curry.

The first item on the program was the reading of a paper by Dr. W. J. Robinson, entitled "The Value of Casting in Crown and Bridge Work."

[This paper is printed in full at page 1108 of the present issue of the Dental Cosmos.]

Discussion.

Dr. J. H. Gaskill. The possibilities of casting are best demonstrated by the essayist's beautiful work. I noticed particularly the cases in which he uses large detachable porcelain crowns. In a great many cases of short bite a rather weak bridge results from this method, and failure is invited because of the porcelain's breaking. In cases of long bite, however, I can see advantages in this method.

When using ordinary facings, I always back them, because I find the facings go back into place a little better than if they are put against the wax itself. To retain the openings in the casting for the pins, I place small graphite pencil points in the holes, which after casting can be easily drilled out. I think the color can be better preserved by backing the facings and casting to the backing.

Dr. O. H. E. Inglis. I heard Dr. Robinson make the statement on one occasion that there is a difference in the structure of gold cast under air and gold cast under steam pressure. I cannot remember which method he said was the better, but I would like to have him discuss that point in closing his discussion.

Dr. F. L. Bassett. I would like to ask whether, in casting, the abutments are cast and united at one time, or if the essayist has to solder the abutments together afterward?

Dr. T. D. Casto. In casting bridges, I cast each abutment and then solder them together afterward. I do not remember where I got the impression that casting was not quite as strong as abutments soldered together, but I think Dr. Lane is responsible for that suggestion. If Dr. Robinson can cast a bridge of four or five teeth and have it as strong as it should be, I think it is about time that I should learn something of Dr. Robinson's method, as it would undoubtedly be the easier method in many cases. I like his method of using diatoric teeth in the lower jaw,

for if there is any reason for using porcelain in the mandible, it is on the occlusal surfaces. It is usually in the lower jaw where gold is exposed mostly, therefore, for esthetic reasons, the places to use such teeth are the occlusal surfaces of the lower teeth.

Dr. Robinson (closing the discussion). In answer to Dr. Gaskill's remarks as to the practicability of using all-porcelain teeth in cases of short bite, I would say that I have found the use of this type of teeth more desirable. A saddle should be made, and the piece allowed to rest on the gum so that no space exists between the saddle and the gum. This is the only hygienic fixed bridge that can be used in cases of short bite. How frequently we remove these so-called self-cleansing bridges and find an accumulation of filth packed so hard between the sloping side of the bridge and the gum that a sharp instrument is necessary to remove the accumulations!

I have brought some plates along for the purpose of showing how strong cast gold is. A bridge made of cast gold is much stronger in my opinion than a soldered one. Cast gold of a high karat is not contaminated with zinc, while solder contains a certain amount of zinc, which may cause it to break.

My objection to using facings in bridge work is that we cannot produce a proper esthetic effect. When facings are used, the gold must extend to the occlusal surface, and that we wish to avoid. I look upon dentistry as a profession that is getting away from the old mechanical ideas. We do not call ourselves mechanics; we call ourselves prosthodontists, and should practice as such. We do not want to put gold on the occlusal surfaces any more than we wish to insert gold fillings in artificial teeth upon plates, as was once the practice. Patients are coming to our offices every day and having gold fillings taken out and replaced with porcelain or synthetic fillings, because they have a greater regard for the natural appearance of their teeth.

Dr. Inglis asked about the difference between using air and steam pressure in casting. Air seems to take a certain amount of spring out of the metal, while steam does not.

Dr. Bassett asked if the parts of the bridge were united in casting, or soldered afterward. The body of the bridge, that is, the part between the abutments, is cast in one piece and united to the abutment pieces by soldering. I have cases here showing this technique.

Dr. Casto spoke of casting the abutments individually. I do not practice that, and have given my reasons in the paper.

The next item on the program for the evening was the reading of a paper by Dr. W. Sterling Hewitt, entitled "Suggestions Toward the Rational Treatment of Various Forms of Pyorrhea Alveolaris."

[This paper is printed in full at page 1110 of the present issue of the Dental Cosmos.]

Discussion.

Dr. Otto E. Inglis. Of this subject of vaccines I confess to have very little practical knowledge. I have hesitated to enter this field, because not long ago a death occurred in this city as the result of the use of vaccine for pyorrhea. I note that Dr. Hewitt has made a very interesting classification of the various forms of gingivitis that come to our notice, and I think it very desirable that, if possible, these diseases be classified and their etiology and symptomatology correlated, so that we can recognize them in each individual case. I have usually treated pyorrhea on the basis that there is a certain number of teeth which can be treated, and that, after teeth have reached a certain point, they must have help aside from any surgical or medical treatment that can be given. In other words, if a tooth has been subject to pyorrhea for a time, there enters an element of malocclusion and looseness, and unless the case is of the type in which the tooth is surrounded by a large amount of tissue, and that tissue under treatment will hug the tooth and, pos-

sibly with a little bone formation, steady it in position—unless such conditions are present, and enough tissue has been lost to allow the tooth to be mechanically moved after persistent treatment, it cannot be saved without a splint. I do not mean to say that teeth cannot be kept in a reasonable state of functional health for a number of years. I have under treatment a case at the present time in which the teeth have been kept in a reasonably stable condition for five years. The woman had pyorrhea quite badly, and the teeth were treated, but remained slightly loose and have remained in about the same condition. I have no doubt that if these teeth had been splinted, they would have been held firmly and would be in much better condition than they are at the present time. They are not tight, and I have never been able to tighten teeth which had a certain degree of mobility, unless I splinted them, and I think I have cured pyorrhea so far as flow of pus and advance of the disease is concerned. A stipulation made to the patients is that, if treatment is desired, they have to submit to prophylaxis treatment at my hands, to be administered every two or three months as in my judgment is best, and I am satisfied that it is quite possible to carry the average case of pyorrhea through a long series of years, with the limitations I have stated regarding looseness.

The statement was made recently by a gentleman skilled in bacteriology and vaccines that he had made many vaccine injections, and had found that in some cases they did good, and that in some they did not. Inasmuch as we do not know the exact cause of pyorrhea, and inasmuch as the purpose of the injection of vaccines is to increase the opsonic index against the parasitic cause, it does not seem a scientific procedure at the present time to introduce autogenous vaccines without a clearer knowledge of the cause of pyorrhea. If this disease is caused by the amœba, how are autogenous vaccines to cure pyorrhea unless an amœba vaccine be produced?

Dr. F. D. Gardiner. My views on the treatment of pyorrhea, gathered from quite an extensive experience, are so at variance with the newer ideas that I do not like to throw cold water upon those engaged in experiments with emetin and serum treatment. I have yet to see satisfactory results in cases treated by these methods. I am ready to be shown, and should welcome such results. I hope an easy way to treat pyorrhea will be discovered, but I have never been able to produce results that are satisfactory to me unless I worked hard for them. All my experience in the treatment of pyorrhea—and I have had success—has been along surgical lines. I have found that absolute sterilization will cure the majority of cases of pyorrhea that are at all amenable to cure. By cure I do not mean immunity; no more should be demanded as "cure" in pyorrhea than in any other diseased condition. There are, however, a great many who demand in the treatment of pyorrhea a greater degree of cure than in any other disease, which I think is unreasonable. So far as my experience goes the use of drugs alone has not cured any pyorrhea cases. Drugs are useful in toning up the tissues which need stimulation. As accessories I think astringents are particularly valuable in some cases, but I find in the majority of cases that, after all irritation is removed, a cure can be brought about without drugs, and in very much less time and with a great deal less discomfort to the patient. I hope that lasting results will come from the use of vaccines, although I feel that, with the present knowledge in regard to vaccines, it is extremely dangerous for anyone except an expert to use them, and that the ordinary dentist has neither the knowledge nor the experience necessary to administer them safely.

Dr. C. S. Tuttle. The vaccines used in the treatment of pyorrhea are not serums, but autogenous vaccines obtained from the pus pocket and suspended in salt solution. Serums have no part in the treatment.

In one very serious case I should like to mention, the articulation was de-

stroyed by loosening of the teeth, the gum tissue unhealthy and markedly irritated, and there was quite a flow of pus from the gums about many of the teeth. This patient, a male, objected strenuously to vaccine treatment, and we started with emetin. When I had the pleasure of discussing Dr. Barrett's paper I had only one partial failure to report, but at this time I have a complete failure to record. This patient was examined at the Oncological Hospital, and amœbæ were found present. Emetin was used, and absolute failure resulted. Examination of this case showed blood pressure to be 145, pulse 86, and weight 117½ lb.

Another case was reported by Dr. Gordon A. Saxon. Treatment is not completed, but there is a marked improvement of the gums, and absence of pus around the teeth, showing the efficacy of vaccines.

In another case emetin was used with very good results; in fact the case was almost completed with emetin, but the woman, fearing a recurrence of the disease, wished to be rendered immune, and having some knowledge of vaccines, insisted that they be used. After the fifth inoculation all signs of pyorrhea disappeared. In this case blood pressure was 142 and pulse 80. Autogenous vaccines were used containing 50 million Gram-negative cocci and 50 million streptococci.

Dr. Hewitt (closing the discussion). I feel more like asking questions than answering them myself. Dr. Inglis spoke of the danger of using vaccines. I think there is as much danger in leaving a case of pyorrhea untreated as there is in treating it with vaccines. In treating a serious case of pyorrhea, which will not yield to the use of local measures, I invariably consult the patient's physician. I immediately call him up and tell him of my findings and the dangers of the condition. If I consider the case suitable for vaccine treatment, I tell the physician what I intend to do, and ask him if there is any reason why I should not proceed. If I consider a case amenable to treatment by emetin, I also advise the physician, because the patient sometimes seems astonished that I should inject emetin in the arm, and cannot comprehend what such an injection has to do with the teeth. In short, I like to have the physician in the background, and besides, I want to know the condition of the patient, as there may be some contra-indication to the treatment.

I have noticed that the presence or number of organisms is not sufficient proof that they are the cause of the disease. For instance, we may find a mouth full of certain organisms, and one particular organism might be comparatively scarce; yet the organisms which are found in great numbers may have a low virulence, and the organism which is scarce may be very virulent. Again, under the microscope, we might find a group of organisms that are present in considerable numbers, and miss the really important one that is comparatively scarce. Again in culturing, we may possibly culture out the wrong ones unless we are careful, for the reason that the organism that is the cause of the disease may not be susceptible to ready culture.

As to Dr. Gardiner's statement as to every case being cured that is amenable to cure by surgical procedure, I think Dr. Tuttle answered that point, and also called attention to the cases which are susceptible to treatment by emetin and vaccines.

In regard to the case cited by Dr. Tuttle in which there was little or no deposit, and where the gums were in bad condition, I would ask him if he saw that case?

Dr. Tuttle. I have the case under treatment at the present time.

Dr. Hewitt. How did it start?

Dr. Tuttle. It started with poor occlusion due to looseness of the teeth and poor gum conditions. I, of course, used surgical means, after using emetin in the mouth, but I inquired first as to whether or not the infection was due to germs or to amœbæ. Judging from the examinations, and from reading the articles of Dr. Barrett and of Bass and

Johns, the amœbæ and the different bacteria run hand-in-hand. No doubt you have all heard Dr. Barrett say that the probable part which the amœba plays is that it digests the bacteria and then pours forth its internal poisons, which cause the trouble, and it is from this that result not only the lesions of pyorrhea, but systemic lesions as well. It is not the presence of amœbæ or of one or several kinds of bacteria in the mouth or the system that causes disease; it is owing to the fact that the white blood corpuscles and the opsonins absorb so many bacteria that we have disease. It is the liberation of the germ's internal poison that causes disease.

Dr. Hewitt. What I am trying to get at is that there is one group of cases where vaccines will work nicely, and another where they will not; there is also a group where emetin works nicely, and another where it does not.

Dr. Tuttle. In the cases I have examined I have found both amœbæ and bacteria present. Do you find that the vaccines which contain only one or two different bacteria are more effective than mixed vaccines?

Dr. Hewitt. I have had best success with mixed vaccines. Whether that is due to the fact that I happened to strike the virulent organisms or not, I do not know.

Dr. Gardiner. A case of pyorrhea is not incurable if there is sufficient bony structure to support the tooth; but if there is not sufficient bony structure, the tooth cannot be permanently cured by any means. The condition can be relieved, but not cured. Loose teeth can be made comfortable, and danger of systemic infection averted for a considerable time, but pyorrheal teeth reach a stage where they are incurable by any means because the sockets have been absorbed.

Dr. Inglis. Can you save teeth which have lost their support and would be considered hopeless, with vaccines?

Dr. Hewitt. I have seen cases ordinarily considered incurable by instrumentation alone, in which the teeth have tightened up after vaccine treatment.

Dr. Inglis. Are the patients able to masticate vigorously?

Dr. Hewitt. Yes. That does not mean that the teeth are as tight as they were originally, but they are satisfactorily tight under the support of a splint to prevent lateral motion.

Dr. Gardiner. Many teeth are curable where the tissues are destroyed on one side of the roots, provided the surgical procedures are carried out properly, but teeth around the roots of which the tissues are destroyed, or isolated teeth that cannot be splinted, cannot be saved.

Dr. Tuttle. We have all seen roots that have fallen over, and have such pockets that we would suppose no attachment to be present, but yet in extracting them we find them firmly attached, and difficult to get out. If such a firm attachment can be produced by vaccines, surgical means, emetin, or any method, and these teeth can be made useful by splints, it is our duty to do so. No one is discouraging the use of surgical means; we need these, but I hope no one will discourage the employment of other means, because we need them also.

The society then adjourned.

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Devoted to the Interests of the Profession.

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PHILADELPHIA, OCTOBER 1915.

EDITORIAL DEPARTMENT.

ASSAYING THE DENTAL COLLEGE OUTPUT.

AT a period when dental colleges were few, and competition among them practically a negligible factor, the diploma, attesting graduation from the dental course, was accepted as *prima facie* evidence of competence to practice dentistry. As dental colleges multiplied and competition for student patronage increased, and as the advantages in professional status supposed to hedge round about a professorship stimulated the ambition of the unfit as well as the competent to enter the professorial ranks, it became evident that the product of the schools was not in all instances trained to that standard of efficiency for entering upon dental practice which the dental profession and the public at large had the right to expect.

To correct this fundamental defect in our educational system, the state was importuned to establish a system of supervision which should "check up" the educational work of the dental schools—with the result that the ancient privilege originally ac-

corded to our dental educational institutions by their charter of licensing their graduates was abrogated, and the right reverted to the state, where it originally belonged. The licensing power was thereafter exercised by the state through the instrumentality of boards of dental examiners responsible to the state as their appointing power.

The provision is characteristic of practically all dental legislation that no dental educator is eligible to appointment upon a state licensing and examining board in dentistry, at least during the period of his connection with any dental educational institution, the theory being that no dental educator shall be permitted to pass judgment upon the products of his educational work in the interests of the state.

No exception can properly be taken to the soundness of this legislative principle, either as law or from the point of view of its practical utility, inasmuch as all legislation concerned with the conservation of the public health is a function of the police power of the state, in the exercise of which power the state is sovereign and supreme. Granting these premises, it is, however, pertinent to inquire into the efficiency of the mechanism by which the state, in the exercise of its right and duty to safeguard its citizens from the effects of incompetent dental practice, is securing the desired result by the methods now in operation. It is a self-evident proposition that the state, and we use that term in its general signification and application, in depriving dental educational institutions of the right they formerly exercised of licensing their own graduates, by implication at least announced its lack of confidence in the results obtained by the college faculties, and also by implication expressed its confidence in the ability and integrity of its own appointees, whose findings are accepted unconditionally by the appointing power.

The effect of this attitude of the state has been profound and far-reaching, in that it has tended to develop in the public mind, and to no small degree in the mind of the dental profession, a conviction as to the fallibility of the teaching faculties on the one hand, and as to the infallibility of the examining bodies on the other. To what extent the view here outlined is tenable is worthy of careful consideration. For the most part those who constitute the *personnel* of the examining and licensing bodies are

members of the dental profession who have had little or no practical experience in educational work, and in a large number of instances no previous experience in the special work of setting and conducting examinations. Many of the appointments are ephemeral in the sense that they are for a brief term only, but are nevertheless eagerly sought by ambitious members of the dental profession who are animated by the same desire that animates the aspirant for the professorial chair because of the assumed, though often transient, distinction which the appointment appears to confer.

This office is the frequent recipient of letters from recent appointees or those seeking appointment upon state boards of examination and licensure asking for books and lists of questions upon various branches forming the subjects of the state examinations, in order that the novitiate or aspirant may "book himself up," so as to be able to fill the office of dental examiner. It is not intended by the foregoing statement to imply that communications of the above-stated character are to be taken as a measure of the qualification of dental examiners in general, but they are sufficiently numerous to constitute what may be regarded as a fair offset to the type of dental educator who, with no more brains or qualification, is willing to accept a teaching position in a dental college faculty—a class which in the state examination system as now in vogue constitutes a defective factor of quite equal magnitude and importance to the defective factors in the college educational system which the state board examination scheme was created to correct.

In the light of the foregoing it is interesting to examine into the report of the Joint Tabulating Committee of the National Association of Dental Faculties presented at the thirty-first annual meeting, in Buffalo, N. Y., January 26, 1914. The Tabulating Committee has done a laborious, painstaking, and interesting work in gathering the statistics from the various state examining boards and presenting them in tabulated form for examination and comparison. The tabulation for 1913 embraces the reports received from forty state dental examining boards, and sets forth the total number of graduates from fifty-six dental colleges, the total number examined, the number who passed, the number who failed, the percentage of failures, and the number of states in which the graduates in each instance were examined. The figures given are

capable of forming the basis of a variety of deductions. The percentage of failures accredited to individual schools varies from 1.8 per cent. as a minimum to 100 per cent. as a maximum, with almost every variation between. A record of failures or successes expressed in percentages is utterly misleading and inconclusive. We are reminded of the incident of a murder which took place in an obscure western village, the first occurrence of its kind in that locality, commenting upon which the editor of the local paper, a firm believer in the impressiveness of percentages, announced that it was regrettable that the number of murders had increased 100 per cent. since last year in his locality.

One school had but two graduates, both of whom failed to pass, each in a separate state, before the dental examiners thereof. This school is charged with 100 per cent. of failures, but the fact that when its graduating class consisted of but two individuals all failed to pass state examinations does not necessarily imply that if its graduating class numbered one hundred, they also would all fail to pass the licensing examinations. So also another institution, which by reason of having six out of eleven of its graduates fail before examiners in two states, is charged with 54.5 per cent. of failures, need not necessarily be graded as an institution that habitually loses more than half of its graduates at the state board examinations.

The plausibility, not to say mendacity, of percentages of state board failures as indicating even remotely the educational efficiency of a dental college ought to be self-evident. We do not think that any candid mind will question the fact that this array of percentages needs more detailed examination as to its meaning, and clarification as to its actual bearing upon the fundamental questions at issue.

One of our contemporaries in commenting upon this report asks, "What percentage of students should be permitted to fail in the state board examinations and entitle the college graduating them to a respectable standing?" Our answer to that inquiry is that the standing of a college in the matter of respectability or otherwise cannot be correctly determined on a percentage basis deduced from the number of failures which its graduates make in attempting to pass state board examinations. The same editor does not attempt to answer himself, but leaves the question

with his readers; for he apparently appreciates the uncertainties of the percentage basis as a standard of respectability when he says: "Certain extenuating circumstances may be urged, viz, the total number of graduates who obtain a correct average, and the number of states in which they have been examined. A college with students examined in its own state would undoubtedly show up to better advantage in these reports than one with graduates examined in half a dozen." And we would add one other "extenuating circumstance" which is fundamental, and that is the nature of the state examination itself, arising out of the fact that in the great majority of instances there is no method whereby the efficiency of the work of the state boards can be checked up, as they themselves are empowered to check up and standardize the educational work of the colleges.

In 1894 (DENTAL COSMOS, page 578) we pointedly called attention to the principle that the applicant for dental licensure has certain inherent rights that the state is bound to respect and to safeguard, and that in any case in which a dental law is so worded that the examiners are clothed with full discretionary power making them the final arbiters of the qualifications of the applicant, the state in such cases is delinquent in its duty and has opened the door for the exercise of favoritism and incompetence upon the part of its examiner appointees. The principle thus laid down became the basis of a propaganda which in due course resulted in the enactment of the dental law of 1897 in Pennsylvania, which, among various other equitable features, provides that "All examination papers, questions and answers thereto, shall be filed at the State Capitol and kept there for reference and inspection for a period of not less than five years"—a provision the salutory effect of which is to make the general public as well as the parties in immediate interest the final arbiters as to the justness and efficiency of the state board dental examinations, and to furnish the means of definitely determining the equities in any question arising between the colleges or the candidate and the state board.

Until that or similar provision is made whereby in all states the work of the examining boards shall be open to public inspection, the work of the boards will necessarily be open to the suspicion of fallibility in precisely the same degree that the work of

the colleges has been; and further, until some such means as is herein suggested for the revision and the checking-up of the work of the boards is attainable, their statistics as to the percentages of failures or successes in passing their examinations will be significant only to those who delight in utilizing such untrustworthy data for the purpose of making invidious distinctions favorable to their own selfish interests.

We think that the state boards owe it not only to themselves and their best interests, but particularly for the best interests of dental education, the efficiency of which it is assumed that they in their degree are endeavoring to improve, to see to it that their work is made a matter of public record by law, and thus eliminate the grounds for criticism which present conditions go far to justify.

Not only is it essential that the details and results of all licensing examinations should be made matters of public record, but it is equally important that in this essentially educational activity there should be more intelligent co-operation between the state boards of dental examiners and the dental college faculties. In a few instances such co-operation exists, but in the great majority of cases the boards are under present conditions totally ignorant of the extent, character, and scope of instruction which the applicant for license has received in the institution from which he has been graduated.

The truth of the old proverb that "One fool can ask more questions than seven wise men can answer" is paralleled by the undeniable fact that a board of dental examiners can ask questions which have no counterpart in any standard dental college course. A student may be thoroughly grounded in a special department of chemistry and be totally ignorant of the data related to another department of chemistry, and whether he passed or failed in a state board examination on that subject would depend upon the chance of his having had submitted to him a question paper related to his special field of training or not. The same applies to all departments of the curriculum. These are fundamental difficulties that must be adjusted before any tabulation of the state board examination results can have definite value or real meaning other than, as in the present instance, of pointing to the necessity for doing what is herein suggested.

In so far as the report of the Tabulating Committee of the National Association of Dental Examiners has served to call attention to this need it has done a notable work, but until the Association of Examiners makes accessible for public inspection the detailed features of its underlying work, the report of its Tabulating Committee can only be regarded as partial and one-sided.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

SECTION I.—*Dental Anatomy, Histology, and Physiology.*

INNERVATION OF THE ODONTOBLASTIC LAYER AND OF THE DENTIN. BY PROF. DR. DEPENDORF, LEIPZIG.

The writer's specimens show that, in all pulps, neurofibrillæ outside of the odontoblastic layer penetrate to Tomes' fibers in the dentin. They also penetrate through the odontoblastic layer into the dentigenous layer and into the dentin, by way of the intercellular spaces. From the dentigenous substance and in the dentin they are distributed in the area of the intercellular substance, and take a course independent of Tomes' fibers, forming a wide-meshed network. Neurofibrillæ are also found in the area of Tomes' fibers within the dentinal tubuli. Hence the nerve fibers in the dentin have two courses; one within the basic intercellular substance, the other within the dentinal tubuli, and there may be a possible connection between these fibers. Possibly their function differs, one group governing sensation, the other nutrition. Nerve-endings are observed in the pulp, the odontoblastic layer, and in dentin at the dento-enamel junction. These endings are usually simple in the pulp and the odontoblastic layer; at the outer surface of the dento-enamel junction they are exhibited either as simple terminal nets or as slightly bulbous thickenings.

In the peridontium, the course of the larger vessels and the nerve bundles follows the arrangement of the prism-like connective tissue bundles, while the more delicate vessels and individual nerve fibers run independently of these bundles. Generally the nerve bundles follow the vessels, while the finer isolated fibers take a course independent of the vessels. The main nerve bundles and fibers follow the longitudinal direction of the peridontium. We can distinguish coarse, fine, and minute nerve fibers, the first representing nerves of the first, the others nerves of the second and third order. Besides their size and diameter, three groups of nerve units can be distinguished: (1) Parallel thick longitudinal fiber bundles; (2) thinner nerve bundles given off from the former at an acute angle; (3) simple medullated and non-medullated nerve fibers given off from both. The nerve bundles form networks of coarse and fine mesh, from which finer fibers are given off. The termination of non-medullated fibers consists usually in delicate, simple tips within the peridontium, chiefly within the area of the cementoblasts. Other axis cylinders penetrate into the cementoblastic layer, where

they terminate, or they traverse this layer. Besides free terminals in the peridontium and within the cementoblastic layer, we find peridontal nerves terminating within the medullated spaces of the bone and the gingival papilla in the form of simple processes of the minute branches of the nerve bundles. There is an anastomosis between the nerves of the peridontium and those of the bone and the gingiva.

SECTION II.—*Dental Pathology and Bacteriology.*

REPORT OF A CASE OF EXTRA-CAPSULAR ODONTOCELE.

BY A. ALAN FORTY, LEEDS, AND A. HOPEWELL-SMITH, LONDON.

The case presented under the title of an "Extra-Capsular Odontocele" is of peculiar interest, since the writers had the somewhat rare opportunity of observing it over a period of years—1906–12, six years in all. During these six years they were enabled to study from a clinical point of view the slow but steady development of the tumor in the right maxillary incisor region which forms the basis of this report.

The patient, a boy, G. W., about eight years of age, presented in August 1906 on account of lack of eruption of the incisor teeth in the right maxillary region. The condition was as follows: *Maxilla*—The upper first molars, right and left, had erupted, also the left central and lateral incisors, together with the deciduous canines and molars, all in place. The condition of the mandible was normal in regard to development of teeth, but showed some contraction and crowding. The right maxillary condition exhibited a fulness as if the successional teeth were about to erupt.

Owing to the unilateral absence of the incisors at about nine years of age, a skiagram was taken, and the interpretation put on it was that the teeth present in the alveolus were the canine and incisors, but abnormally placed, therefore retarded in erupting, and a waiting policy was decided upon.

The earlier history of the patient was that he was a first child and forceps were employed at birth—evidently considerably compressing the head and lacerating the scalp—for a scar longitudinal in direction exists in the occipital region—and the other blade had probably compressed the facial and maxillary region. Whether this had any effect in predisposing toward the present condition is difficult to say. The boy was backward in mental development—slow in speech and slow and deliberate in his movements, especially in putting his clothes on and off.

In January 1907, as the swelling was increasing in size and no teeth appeared, Mr. Lewin Payne was called in. Mr. Shenton skiagraphed the case for him. He was of the opinion that the three teeth were present, but with curved roots and abnormally placed. He inclined to the opinion that they would eventually erupt. At this date a cystic cause of the retarded eruption was suggested—but the skiagrams rather negatived this, since no thickening of the overlying wall or capsule could be made out.

In 1908 the case was again skiagraphed by Dr. Rowden. The result shows more clearly the three teeth, well developed but juxtaposed in abnormal relation—also the overlying wall of bone—but scarcely giving in clear definition the morphological peculiarities of the first incisor, to enable one to diagnose the condition exactly. One can but assume that the special features of the first incisor and its capsule had not at this date developed to an extent to exhibit anything to lead one to suspect the developmental changes taking place.

In July 1909, three years after first seeing the case, the second incisor pierced the gum, in rather a lingual position, about three or four years later than the average age for eruption. At this date the deciduous molars had been replaced by premolars unusually well developed. In April 1910 the canine tip presented in a buccal position, *i.e.* at about the normal time for eruption. A skiagram the following year revealed the teeth clearly defined and an unusual shadow of the first incisor. In May 1912 the teeth in the maxilla were all erupted save the right central incisor, and the physical signs now were a rounded bony swelling painless to touch, at the most prominent part of which the hard wall was exposed owing to the mucous membrane thinning over it. This exposed portion was thought by the patient and friends to be the erupting tooth, but examination with a probe proved its true nature to be bone.

A dentigerous cystic condition was now

diagnosed, and another skiagram of Dr. Rowden's shows beautifully the peculiar pathological excrescence on the unerupted incisor. A rounded mass of less dense texture was attached to the lingual sulcus of the teeth.

Radical treatment was then decided upon, having waited six years; and the same month Mr. J. F. Dobson, surgeon to the Leeds Infirmary, who had been called in consultation, undertook the operation. A mucous flap was resected, exposing the bony enlarged rounded wall. This was chiseled away and the tooth was seen lying in a cavity rather deeply placed and rotated—making removal particularly difficult. On further bone removal, however, the tooth was rescued with its special features more or less undamaged.

The cavity was scraped and packed, and healed most satisfactorily, with very little alveolar deformity—which was easily restored by artificial means.

SECTION III.—*Dental Surgery and Therapeutics.*

EXTRACTION OF LOWER WISDOM TEETH SITUATED IN HORIZONTAL DIRECTION. By PROF. FRANCIS JEAN, PARIS.

The lower third molar often presents an anomaly of situation in horizontal direction, and causes all kinds of troubles, such as pyorrhea, osteitis, stomatitis, abscess, and caries of the distal surface of the second molar. Jean recommends partial resection of the crown of the second molar so as to permit application of the forceps for avulsion of the impacted tooth.

CLINICAL SYMPTOMS OF PYORRHEA ALVEOLARIS. By ZAHNARZT H. J. MAMLOK, BERLIN.

Two groups are recognized; as follows:

(A) *Subjective symptoms:* (1) Loosening of the teeth; (2) slight bleeding of the gingivæ; (3) putrid taste and viscous deposits; (4) fetor of the breath; (5) secretion from pockets; (6) hypersensitivity of dentin, chiefly at the cervical margin, pulpitis and neuralgia; (7) general discomfort due to reduced masticating efficiency, lack of appetite, waking at night due to flow of pus and desire to rinse the mouth, increasing nervousness; (8) recession or hypertrophy of the gingiva.

(B) *Objective symptoms:* (1) Those disclosed by examination of the mouth—loosening of the teeth, recession or hypertrophy of the gingiva, secretion, bleeding upon slight touch of the gingivæ, formation of pockets and granulation, deposits of tartar, fetor, formation of fistulæ and abscesses, excess stress on sound teeth, discoloration of the gingiva and mucosa, dislocation of single teeth, deviation or elongation of teeth, dull sound on percussion, destruction of the gingival festoons, which appear as if rolled back, affection of the lymphatic glands, reactions of the pulp. (2) X-ray findings (Dieck)—deposits of tartar on the root, changes in the bone tissue, degree of looseness, extent of granulations, resorptions. (3) Microscopic findings—bacterial (Shmamine), histo-pathological and anatomico-pathological (Roemer). (4) Serological findings (Proskauer).

PROPHYLAXIS OF ORAL SEPSIS. By WM. HERN, M.R.C.S., L.D.S.

The writer emphasizes the important position of preventive medicine in the practice of medicine and surgery, and their no less important rôle in the practice of dental surgery.

He then proceeds to give a review of the conditions of the environment of the oral cavity. The mouth is a perfect incubating chamber difficult to control, owing to the presence of the teeth and the anatomical relation of the gums to them acting as physical barriers to cleansing. Movement and friction are the natural controlling factors. An important part is played by the movements of the tongue, lips, and food in the restraint of micro-organic growth and development. The writer further discusses the clinical characters of a normal healthly mouth—the gums and mucous membranes, the teeth, the tongue, the breath—the deviations from the normal which occur when natural friction is restricted or is in abeyance, and the effects of artificial friction or shampooing on the gums.

He speaks of the supreme importance of friction, natural and artificial, in the prophylaxis of oral sepsis, the use and action of the tooth-brush, other prophylactic agents—massage, floss or woven silk, toothpicks—the rôle and place of antiseptics, tooth-powders, and pastes, and concludes with an enumeration of measures of direct and indirect importance in prophylaxis.

SECTION V.—*Dental Prosthesis.*

INTRA-ORAL ARTICULATORS. BY L. RUPPE, PARIS.

The intra-oral articulators are appliances representing the occlusal surfaces of the teeth articulated by means of hinges and joints. When placed upon base-plates, put in the mouth, and exposed to the prolonged action of the masticatory movements, they take on the form, direction, and arrangement which the occluding surfaces should have in order to function normally. In order to reproduce these triturating surfaces in the plates, a cast of each model is made, and upon the cast teeth are set up which reproduce the forms obtained by the intra-oral articulators.

DYNAMIC STUDY OF THE PIVOT TOOTH. BY DR. G. VILLAIN, PARIS.

Having studied the mechanical forces exerted upon a pivot tooth and the resistance offered to these forces by the dental tissues during the act of mastication, the writer gives preference to—(1) Richmond crowns with full bands for all lower teeth and upper bicuspids and molars, also all abutment teeth; (2) Half-band crowns for upper anterior teeth; (3) Unbanded pivot teeth should be used only in anterior teeth, and only when the condition of the tooth or root permits the making of a plane inclined lingually in the upper jaw, labially in the lower jaw, the prolongation of this plane to form a tangent to a circle which has for its center the lingual extremity of the pivot and for its radius the distance between this point and the cervico-lingual or cervico-labial angle of the root. The pivot must be of rigid metal, preferably 30 per cent. iridio-platinum, round, and possess a minimum length of 1 1/3 the height of the artificial crown, in the average overlapping tooth. This length is reduced in case of edge-to-edge bite. The articulation must be secured by the direct method of registering the movements of the mandible on a wax plate.

PROSTHESIS BY FULL DENTURES WITHOUT USE OF THE ARTICULATOR. BY BERNARD FRANK, AMSTERDAM.

Considering Angle's views on normal occlusion as one-sidedly anatomic, the writer regards as normal every natural denture in which all the masticating surfaces of the lower teeth permit of free, intimate contact with those of the upper ones during mastication. The position of the teeth is not governed by the movements of the jaw, hence by reproducing the jaw movements we cannot ascertain the correct position of the teeth. The writer, therefore, rejects all articulators. In his opinion it is the position of the teeth which controls the jaw movements. An artificial denture which corresponds to the idea of physiological normality will function correctly. In an edentulous mouth, the writer reproduces, whenever possible, the full physiologically normal, hence correctly functionating, denture of another individual, following Warnekros' principle. The jaw movement will become adapted to such a denture and render it serviceable. By means of a craniometric transporter, the casts of the mouth are placed in correct anatomic relationship to definite planes of the skull and to each other, on a "recipient" on which the denture is set up.

SECTION VI.—*Orthodontics.*

PRINCIPLES AND LAWS OF THE HUMAN DENTAL MECHANISM, AND THEIR BEARING UPON ORTHODONTIA AND PROSTHESIS. BY DR. G. VILLAIN, PARIS.

Having studied the mechanical laws governing the constitution of the dental system or favoring its re-establishment when the equilibrium of the forces maintaining it is disturbed, the writer wishes to demonstrate—(1) The importance of the variation of the individual mandibular movements and the proportionate amplitude of each in the establishment and maintenance of the individual form of the arch. (2) He wishes to show that these movements themselves depend upon a correlation with the condyle path, the form of the cusps of the teeth, the direction, situation, or arrangement of the teeth in relation to the horizontal, frontal or transverse, and sagittal or antero-posterior curves. All these factors play an important rôle in the establishment of certain deviations, and their significance must not be overlooked either from the point of view of prophylaxis or of maintenance of the result obtained by orthodontic treatment. From the prosthetic point of view, these factors, besides their functional utility, are important in regard to the stability, retention, and resistance of appliances.

SECTION VII.—*Oral Surgery and Surgical Prosthesis.*

CASES OF TUMOR OF THE JAWS. By ROBERT H. IVY, M.D., D.D.S.

The cases reported occurred in the service of Professor M. H. Cryer, of the University of Pennsylvania, and have been selected for various reasons. Case 1 gives the clinical and histological features of adamantinoma. Cases 2 and 3 are examples of calcified composite odontoma. Case 4 is one of fibrous epulis. Case 5 represents a giant-cell epulis of the ordinary type. Case 6 is an example of giant-cell epulis of the endothelial type. Special reference is made to differences in histological characteristics of these two forms. Case 7 belongs to the rare group generally known as adenoma of the soft palate.

The paper is illustrated by thirteen lantern slides showing radiographic, clinical, and histological features of the tumors.

SECTION VIII.—*Anesthesia (General and Local).*

INJECTION (INTRA-ALVEOLAR) ANESTHESIA IN CONSERVATIVE WORK. By ARTHUR H. PARROTT, B.D.S.BIRM., L.D.S., ENGLAND.

The writer's paper covers the following points: (1) Its objective and reasons for its adoption. (2) Advantages and disadvantages of local anesthesia in conservative dental operations. (3) Description of methods—(*a*) septal and (*b*) intra-alveolar. (4) Technique; points to observe and avoid. (5) Drugs and appliances employed, sterilization, etc. (6) Toxic effects and reflexes, immediate and subsequent; their avoidance, prevention, and treatment. (7) Local sequelæ: their avoidance and treatment. (8) Treatment of teeth under local anesthesia. (9) Immediate extirpation of pulps and after-treatment. (10) Scope and limitations; comparison with other methods of avoiding pain. (11) Selection of cases.

EXPERIENCES WITH PROLONGED GAS ANESTHESIA. By DR. MED. MAX MELCHIOR, COPENHAGEN.

The author describes the methods of nitrous oxid anesthesia used at the School of Dentistry in Copenhagen, and the use of the Coleman's apparatus. He gives a record of cases, and discusses the period of anesthesia, signs and symptoms, and the advantages and disadvantages of prolonged gas anesthesia.

SECTION IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

EPIDEMIOLOGY OF DENTAL DISEASES. By PROF. DR. ARRIGO PIPERNO, ROME.

The author proposes and illustrates the following scheme for the study of epidemiology of dental diseases:

(I) Epidemiology—(*A*) History and geography; (*B*) financial loss; (*C*) etiology; (*D*) sources of infection; (*E*) predisposing or immunizing agents, organic or individual, physical, economical, or social.

(II) Prophylaxis—(*A*) International; (*B*) national (state); (*C*) municipal (local), against the pathological agent, against the predisposing causes.

Aids—Individual and social benefactions.

PERISCOPE.

Fastening Stones to Worn-out Mandrels.—Worn-out mandrels may be made to hold a stone well by placing a little soft cement on the screw and running to place in the engine.—*Austral. Journ. of Dentistry.*

Nitrous Oxid Analgesia in Obstetrics.—Lynch is of the belief that nitrous oxid analgesia will make the use of scopolamin-morphin unnecessary in the treatment of private cases. Its ease of administration and freedom from danger speak volumes for its popularity. Nor is the technique complicated, or the good results limited to one man. Unlike the Freiburg method, it is adapted to work in the private home, and is devoid of its many dangers.—*Journ. Amer. Med. Association*, per *Therapeutic Gazette.*

Treatment of Rotated Anterior Teeth.—Tortion of anterior teeth is almost invariably associated with lack of space. It is therefore contra-indicated to undertake a correction of this condition before the strain on the intermaxillary bone has been relieved by expansion; the rotated teeth can then be easily and quickly brought into normal position.—*Zahnaerztliche Orthopaedie und Prothese.*

Cavity Toilet Preparatory to the Insertion of Synthetic Porcelain.—The toilet of a cavity preparatory to the insertion of a synthetic porcelain filling must be as thorough as if a metal filling were to be used. To the ordinary toilet should be added the varnishing of the dentinal walls as a precaution against the material absorbing either acid or moisture from the walls or against the absorption of part of the fluid from the material by excessively desiccated dentin. Usually the rubber dam should be applied.—C. Davis, *Western Dental Journal.*

Oral Sepsis in Relation to General Disease.—Oral sepsis is sometimes tolerated by the patient for many years with little apparent injury. It is, however, always a possible source of danger. It may give rise to—(1) Disease in the vicinity of the mouth; (2) disease in organs which come directly in contact with the unhealthy secretions of the mouth, such as the stomach and the intestines; (3) disease in distant parts of the body not in direct communication with the morbid secretion; (4) a state of ill health and lowered vitality, without obvious involvement of any organ. It may thus be said to aid and abet disease arising from some other source. Oral sepsis is commonly the result of imperfectly cleansed teeth, and does not necessarily involve the extraction of teeth.—H. L. McKisack, *Brit. Med. Journal.*

Fractures of the Mandible in Children.—In young children it is sometimes impossible to make a diagnosis immediately after the mandible has been fractured, except by the use of skiagraphy or by the aid of an anesthetic; nor is it strictly necessary so to do. The parts are so much inflamed and swollen with effused blood that, even if a fracture were detected, it would be harmful as well as painful to apply pressure in any form over the swollen tissues. After a few days most of the blood and exuded lymph will have become absorbed, the inflammation will have subsided, so that the mouth can be opened to a greater extent, and a more thorough examination made with a view to diagnosis and subsequent treatment. Even if wiring of the bony fragments be contemplated, this operation is rendered far easier and less risk of sepsis is incurred if it be delayed until absorption of some of the inflammatory exudation has taken place. Fractures in children can usually be treated satisfactorily with metal, gutta-percha, or poroplastic splints molded to the outside of the jaw. In adults, if there be but little tendency to displacement of the fragments, the same methods will suffice.—F. Coleman, *Ash's Monthly.*

A New Operation for Bilateral Bony Ankylosis of the Lower Jaw.—Misch describes his operation as follows: (1) Horizontal incision along the zygomatic arch, which is turned down after a double osteotomy; (2) cutting through the insertion of the maxilla temporalis together with the tip of the coronoid process (osteotomy of the latter); (3) resection of the ankylosed joint-head or subperiosteal wedge-shaped osteotomy of the neck with interposition of a flap of muscle or aponeurosis, also free plastic with fascia lata, as used in one case on one side. If possible, the operation is carried out on both sides at one sitting. This operation was successfully performed on a girl of fourteen years with an ankylosis of eleven years' duration.—*Zentralblatt für Chirurgie* per *Surgery, Gynecology, and Obstetrics.*

Accidental Loss of Gold in Casting by the Centrifugal Method.—Referring to a reported account of complete loss of an ingot of gold which flew accidentally from the ring in casting by the centrifugal method, as a consequence of which the laboratory man was accused of having stolen the gold, Albrecht relates an incident which occurred to him and which clearly demonstrates the injustice of the suspicion in the case just mentioned. He had melted about twenty dollars' worth of gold. In centrifuging, the investment broke at the bottom of the ring, and the gold flew out. Despite a careful search of several hours, no trace of the gold was found. A microscopic examination of collected dust confirmed the assumption that, in being thrown out with great force, the molten gold had divided into dust. The thoroughly collected sweepings of the laboratory were turned over to an assayer, who, after proper reduction and refining, found only five dollars' worth of gold to be left, the rest evidently having been lost in the form of finely distributed gold dust.—*Deutsche Zahnaerztliche Wochenschrift.*

Crown and Bridge Work in Edge-to edge Bite.—In most cases of an edge-to-edge bite, when but a few of the anterior teeth are lost and are to be replaced by crowns or a bridge, it is advisable not to change the bite, by tipping the new crowns or teeth outward, as greater strength of the crowns or the bridge and general harmony of the facial expression is thereby obtained. Often have I seen attempts made to correct an edge-to-edge bite with a bridge, crowns, or a plate having the upper incisors overlapping the lower incisors, while the canines and bicuspids still remain set in—this giving anything but a satisfactory result. Also, in building a bridge or partial plate to meet the teeth of a narrow upper or lower arch, it is best to be satisfied with a sufficient occlusion rather than to attempt to get the other extreme. Only in cases of the restoration of an entire upper, a lower, or both, would it be advisable to correct an edge-to-edge bite for a patient of advanced age, producing a normal occlusion.—J. F. Hovestadt, *Journ. Allied Dental Societies.*

Constructive Diseases of the Pulp.—The constructive diseases of the pulp are an evidence of an attempt on the part of the pulp to protect itself, but with the exception of tubular calcification, or, perhaps, of a very regularly deposited secondary dentin, the effects react upon the pulp itself, causing its destruction. They all tend to the production of neuralgia and vague dental pains, and all tend greatly to complicate the proper cleansing and filling of the pulp cavity. Consequently, there should be no hesitancy in removing such pulps in such cases as have been invaded deeply, and much of the pulp chamber has become filled with secondary dentin. Pulp removal, therefore, is indicated: In abrasion, when the crown has been worn to about one-half of its original length; in erosion or abrasion when the area has invaded the pulp chamber, which is partly filled with secondary dentin; when preparing teeth for shell crowns and much removal of tissue is necessary; in the treatment of advanced pyorrhea; in facial neuralgia when associated with or superinduced by pulp degeneration.—E. Larbalestier, *Pacific Dental Gazette.*

Method of Mixing Amalgam.—The proper mixing of amalgam is best accomplished by the use of a deep glass mortar—the inner surface of which has been slightly dulled, not ground—and pestle of such design as to afford a firm grasp being taken of its handle. The head of the pestle should also be slightly dulled. The time required, and the rapidity of movement of the pestle necessary for thorough amalgamation make the use of the shallow mortar impracticable because of the danger of loss of some of the contents during the operation. A rough inner surface of the mortar tends to grind the alloy, which is objectionable, to say nothing of the extreme difficulty in completely removing the plastic mass, and keeping the mortar clean. Mixing in the deep glass mortar should be done thoroughly by a rapid movement of the pestle in such manner as to keep the mix always at the bottom of the mortar; this will necessitate the constant rubbing or shaking down of that portion which collects on the sides. The force exerted in mixing should not be one of grinding, but of moderate rubbing together, to accomplish the most complete amalgamation. Such mixing should be continued for two minutes by the watch as a minimum length of time, followed by kneading the mass for one minute. This time requirement applies to all mixes made of from ten to thirty grains of alloy, but a mix of less than ten grains might require a little less time, and a mix of more than thirty grains will require more time. Some alloys may possibly require a little more time for mixing, but never less—I am speaking of the high-grade alloys, containing 65 to 73 per cent. of silver, as these are the only alloys worthy of consideration.—W. E. Harper, *Dental Review.*

Tests of Leaking Amalgam Fillings.—With the desire to learn something more of the action and appearance of leaking fillings, the writer has made an air-pressure appliance somewhat similar to that suggested by Dr. Southwell of Milwaukee. This appliance is very simple, consisting of a pressure tank with pump and gage. The air is conducted from the tank to four taps on to which the steel cavities with test fillings are screwed and immersed in water for the test. The cavities are made in steel, and are of two forms. One is a simple round cavity, the other is made to represent an approximo-occlusal cavity similar to what we might find in molars. The walls are exactly parallel, and there is no bevel to the margin. They are so made that some part of the seat of the cavity consists of the flat end of a screw, that is to be removed when the filling is completed, so that the cavity may be placed upon the testing appliance for the pressure test.

To make the tests, the fillings should be placed in a glass dish of very clear water, so that they may be seen from all sides. The

air-pumping should be begun very slowly, that the margins of all the fillings may be carefully watched for bubbles of air which may begin to leak at a very low pressure. Indeed, it is surprising how little pressure is required to cause air to pass about the great majority of fillings. Of 110 fillings made and tested by this appliance, 42 resisted to exceed two pounds' pressure without leaking air about the margins. All the rest leaked at from a few ounces' to two pounds' pressure. A very few fillings failed to leak at the maximum pressure of 45 pounds. A large number leaked at so low a pressure that the gage would not register. Twenty-six different operators took part in these tests, and it is quite unnecessary to say that they all did their best. There were twenty-three different alloys used, and every effort was made to test out those that were the best known and most popular. It is safe to say that of this number of alloys only three are well enough balanced to make a perfectly and permanently tight filling. If a few ounces' pressure will cause a violent leakage of air about the margins of a filling, we have no reason to believe that such a filling in human teeth would resist the ingress of moisture and bacteria under such air-pressure as might be exerted in the human mouth, or under the pressure in the act of chewing certain hard and sticky foods.—W. G. CRANDALL, *Items of Interest.*

OBITUARY.

DR. GREENE VARDIMAN BLACK.

[SEE FRONTISPIECE.]

DIED, at his boyhood home on a farm near Jacksonville, Ill., on Tuesday, August 31st, from an attack of pernicious anemia, GREENE VARDIMAN BLACK, M.D., D.D.S., Sc.D., LL.D.

The funeral was held at 2 P.M. on Friday, September 3d, from the residence of his son, Dr. Carl E. Black, in Jacksonville. After an extremely simple service his remains were interred in Diamond Grove Cemetery, Jacksonville. The services were conducted by the Rev. Dr. A. B. Morey, assisted by Dr. F. S. Hayden of Illinois College, who with President Edwin J. James of the University of Illinois and others paid eloquent tribute to the splendid character and achievements of this undisputed leader in the world of dentistry.

Dr. Black was born near Winchester, Scott county, Ill., on August 3, 1836. His father moved to what is now called Cass county, Ill., about 1844, settling on a farm seven miles southwest of Virginia, Ill., where four of his sons resided. Dr. Black was reared on the farm and had a very limited early education at the country school which he attended for a few months for several winters. Though he was an apt student and tireless reader, he developed his own mind largely in the school of nature, as he soon became familiar with the flora and fauna of the prairies and forests adjoining his early home, located as it was in a region teeming with life in its varied forms—all of which served in those formative days to develop the taste which later on became the scientific interest upon which his larger life activities were focused. At the age of seventeen he made his home with his brother, Dr. Thomas G. Black, with whom he read medicine, and at the age of twenty-one he began the study of dentistry with Dr. J. C. Speir of Mt. Sterling, Ill., and in 1857 established a dental office at Winchester, Scott county, where he remained until 1862, studying constantly in the meantime, until he entered the army in the civil war as a private. During the war he served as a sergeant, but was engaged most of the time on special scouting duty. He was injured in the knee-joint and spent six months in the hospital at Louisville, Ky.

Returning home, he went to Jacksonville, Ill., where he opened a dental office in 1864, continuing in practice there until 1897. At this time he applied himself to the study of chemistry, establishing a complete working

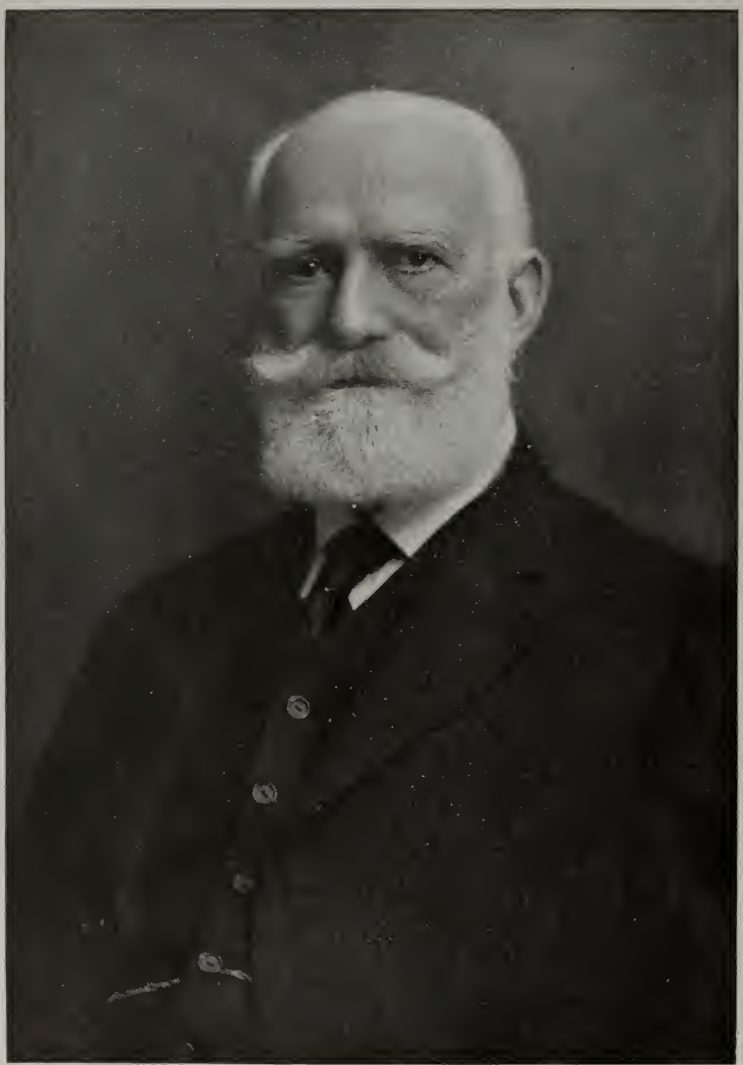
laboratory in connection with his office. He organized a class in chemistry among the public school teachers, which he taught for several years, also taking a prominent part in the medical organizations of the city and county.

He became widely known as an author and lecturer on scientific topics pertaining to his profession. His writings have been translated into many languages and are standard authorities on the subjects they discuss. His contributions cover a wide range of topics and all are characterized by lucidity of style, profound research, a judicial quality of mind, and scientific exactness. Many of his larger contributions are illustrated by original drawings made by himself. He was not only a prolific contributor to the literature of dentistry, but an inventor of many of its most important appliances, and he gave particular attention to the development of instruments of precision for the scientific study and use of materials necessary to dental practice. A number of his inventions were successfully utilized by their author in the prosecution of elaborate lines of scientific investigation, the results of which have been of the utmost value and practical utility to his colleagues, and indirectly to the world at large, in that they have resulted in more precise methods of work and a notably higher efficiency in dental operative practice.

It has been said that a prophet is not without honor save in his own country. The life and work of Dr. Black and the universal recognition accorded to him as a benefactor of his calling is a notable exception to if not a practical refutation of that aphorism. No man in the history of the dental profession has been more generally beloved or more highly honored for his character and accomplishments than Greene Vardiman Black. In 1877 the Missouri Dental College conferred upon him the honorary degree of D.D.S.; in 1884 the Chicago Medical College conferred the honorary degree of M.D. upon him; in 1892 he received the Sc.D. degree from Illinois College, and in 1898 the LL.D. degree from the Northwestern University. In 1915 the University of Pennsylvania conferred upon him the degree LL.D. He was elected to honorary membership in practically all of the world's representative dental associations. He was the first recipient of the Jarvie Fellowship medal of the Dental Society of the State of New York, and the first recipient of the Miller Prize medal, both of which distinctions were granted to him because of the excellence and number of his contributions to dental science and art.

As a teacher Dr. Black exerted a profound and lasting influence upon the trend of thought and activities of his profession. His formal teaching career began in 1870, as lecturer on general and dental pathology in the Missouri Dental College at St. Louis, a position which he held until 1880. Subsequently from 1883 to 1889 he was professor of dental pathology in the Chicago College of Dental Surgery, after which he was identified for one year with the dental department of Iowa University as professor of dental pathology and bacteriology. In 1891 he was called to the Northwestern University Dental School to fill the professorship of operative dentistry, dental pathology and bacteriology, being afterward made dean of the school, both of which latter positions he occupied until his decease.

Dr. Black was an indefatigable worker of astonishing productiveness and versatility, but his work was done for others, not for himself. He had frequent opportunities to commercialize the results of his work, and repeated attempts were made to induce him to convert the results of his activities into material gains, but these he consistently and persistently resisted, devoting his energies exclusively to the elucidation of problems the solution of which were for the benefit of his colleagues. To no man of his time is the profession of dentistry under greater obligation than to him. His simple unaffected personality, the depth of his learning, his willingness to learn from others, and his unfailing spirit of helpfulness won for him not only the respect and admiration, but the affectionate regard of all who came into contact with him. President James said of him, "In certain lines his is the most distinguished name in the annals of American science. He was a man of whom his institution, his community, state, and nation may well be proud, and his passing is a great personal loss to thousands of his former students and colleagues"—an estimate which will find sympathetic acceptance not only in America, but wherever dentistry is known throughout the world.



DR. FANEUIL D. WEISSE.

DR. FANEUIL D. WEISSE.

Died, June 22, 1915, at his summer home, Gedney Farms, N. Y., after a short illness, Faneuil Dunkin Weisse, M.D., dean of the New York College of Dentistry, in his seventy-third year.

The deceased was born in Watertown, Mass., as a descendant of Peter Faneuil, who donated to Boston the historical building which bears his name, Faneuil Hall. The father of the deceased, Dr. John A. Weisse, a noted philologist, took personal charge of his son's education for twelve years, enabling him to enter the Medical College of New York University, from which institution he was graduated with the degree of M.D. in 1864.

The deceased began his career as a medical educator under Dr. Valentine Mott, professor at the New York University Medical College, in 1863, and was one of the founders of the New York Dermatological Society and the American Venterinary College. He was appointed lecturer and clinical professor of dermatology at the university in 1865, and occupied the chair of surgical pathology at that institution from 1874 to 1875, holding the professorship of practical and surgical anatomy for thirteen more years.

Beside these important positions, Dr. Weisse, following his graduation, was called to the chair of surgical pathology at the New York College of Veterinary Surgery, and for almost fifty years was professor of anatomy, surgical pathology, and oral surgery at the New York College of Dentistry, which institution chose him as its dean in 1897. He published, in 1886, a text-book on "Practical Human Anatomy," as the result of seven years of labor and research.

Dr. Weisse's first wife, Mary Elizabeth, *née* Suydam, died about seven years ago, leaving him two sons. In August 1910, Dr. Weisse married Mrs. Mary Churchill Ripley of New York, who survives him.

The funeral services were held at St. Mark's Church, New York City, in the presence of a large number of students and noted representatives of the medical and dental professions. Interment was made at Evergreen Cemetery.

Society Notes and Announcements.

NOTICES should reach the Office of the DENTAL COSMOS not later than the 10th or 11th of the month preceding that of publication.—ED. COSMOS.

NATIONAL MOUTH HYGIENE ASSOCIATION.

A series of illustrated lectures on Mouth Hygiene has been prepared by this association for rental service. The first lecture of the series, a talk suitable for a mixed adult audience or school pupils above the age of twelve years (designated as lecture "A") is now ready. The lecture set (manuscript and 36 slides) will be furnished to members of state dental societies and others who may be considered competent to present the matter to the public, at a fee of One Dollar per use.

For further particulars and application blanks, address the Director of Extension Lectures,

Edwin M. Kent, D.M.D.,
222 Washington st., Brookline, Mass.

NORTHEASTERN DENTAL ASSOCIATION.

The Northeastern Dental Association will hold their twenty-first annual meeting in Springfield, Mass., on October 13, 14, and 15, 1915.

Alvin A. Hunt, *Sec'y*,
Hartford, Conn.

FORSYTH DENTAL INFIRMARY

Opens a Training-School for Women Dental Hygienists.

The Forsyth Dental Infirmary for Children, Boston, Mass., will open a training-school for women dental hygienists on October 4, 1915.

Harold DeW. Cross, *Director.*

LEBANON VALLEY DENTAL ASSOCIATION.

The fortieth annual meeting of the Lebanon Valley Dental Association will convene at Lebanon, Pa., on Tuesday and Wednesday, October 11 and 12, 1915.

E. P. Kremer, *Ch'man Ex. Com.*

NORTHERN ILLINOIS DENTAL SOCIETY.

The twenty-eighth annual meeting of the Northern Illinois Dental Society will be held the third Wednesday and Thursday of October (19th and 20th) in Freeport.

All dentists in northern Illinois who have not been fortunate enough to have attended the Panama-Pacific Dental Congress may find consolation in attending our meeting. Cross the days in your appointment books. Do it now.

F. H. Bowers, *Sec'y.*

FLORIDA STATE DENTAL SOCIETY.

At the last meeting of the Florida State Dental Society, held at Pass-a-Grille, Fla., in June, the following officers were elected for the ensuing year: A. M. Jackson, Lakeland, president; J. L. Williams, Jacksonville, first vice-president; C. J. Caraballo, Tampa, second vice-president; D. D. Crews, Fort Myers, recording secretary; M. C. Izlar, Ocala, corresponding secretary; F. S. Robinson, Jacksonville, treasurer. Executive Committee—C. L. Nance, Tampa, chairman; W. K. Bradfield, St. Petersburg; J. R. Lynn, Fernandina; G. A. Brummett, Fort Myers; H L. Chilson, Bradentown.

It was decided that the next meeting be held in Orlando, Fla., on the third Wednesday in June 1916.

M. C. Izlar, *Corresponding Sec'y,*
Ocala, Fla.

ILLINOIS BOARD OF EXAMINERS.

To All Dentists Licensed in the State of Illinois:

You are hereby notified to procure from O. H. Seifert, secretary of the Illinois State Board of Dental Examiners, with offices located at 305–7 Ridgely Bldg., Springfield, Ill., a renewal of your certificate of registration to practice dentistry in the State of Illinois from and after November 1, 1915, and until November 1, 1917, and that the fee therefor is one dollar, which must accompany the application for renewal.

You are further notified that unless you procure a renewal of your registration certificate on or before November 1, 1915, your license will be revoked. in accordance with the statute.

O. H. Seifert, *Sec'y.*

ARIZONA BOARD OF EXAMINERS.

The Arizona Board of Dental Examiners will hold its next meeting at Phœnix, Ariz., on October 4, 1915. All applications must be in the hands of the secretary at least twenty days before the examination.

J. Harvey Blain, *Sec'y,*
Prescott, Ariz.

NEW JERSEY BOARD OF REGISTRATION.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their semi-annual meeting and examination in the assembly chamber at the Statehouse, Trenton, N. J., December 6, 7, 8, and 9, 1915. License fee $25. Re-examination fee $10.

The following practical tests will be required: Insertion of an approximal gold filling, compound approximal amalgam filling, and a silicate filling, besides a practical test of the applicant's ability in oral prophylaxis; also preparation of a cavity for an inlay with wax pattern. Prosthetic dentistry: Five-piece bridge and Richmond crown in addition to an anatomical articulation of a full upper and lower set of teeth. Teeth to be furnished by applicant. Wax bites properly trimmed and in place on models for inspection before setting up teeth.

Attention is directed to the following re-

quirement: "All applicants for a license to practice dentistry in New Jersey shall present to said board a certificate from the superintendent of public instruction showing that before entering a dental college he or she had obtained an academic education, consisting of a four years' course of study in an approved public or private high school, or the equivalent thereof." In accordance with the law, the secretary will issue application blanks only upon presentation of the required certificate from the superintendent of public instruction, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to the acting secretary.

JOHN C. FORSYTH,
430 East State st., Trenton, N. J.

MICHIGAN BOARD OF EXAMINERS.

THE next regular meeting of the Michigan State Board of Dental Examiners, for the examination of applicants who wish to practice dentistry in Michigan, will be held at the dental college at Ann Arbor, beginning Monday, November 1, 1915, at 8 A.M., and continuing through Saturday, November 6th.

For application blanks and full information apply to

A. W. HAIDLE, *Sec'y*,
Negaunee, Mich.

MARYLAND BOARD OF EXAMINERS.

THE Maryland Board of Dental Examiners will meet for examination of candidates for certificates on November 4 and 5, 1915, at the Baltimore College of Dental Surgery, Baltimore, at 9 A.M. For application blanks and further information apply to

F. F. DREW. *Sec'y*,
701 N. Howard st., Baltimore, Md.

EXAMINATION OF DENTISTS FOR THE U. S. NAVY.

INFORMATION received from Surgeon-general of the Navy W. C. Braisted states that the next examination for the appointment of acting dental surgeons in the navy will be held at Washington, D. C., on November 29, 1915. At the present time there are two vacancies.

Application should be made to the Chief of the Bureau of Navigation, via the Surgeon-general, U. S. Navy.

A circular supplying "Information for Persons Desiring to Enter the Dental Corps of the United States Navy," and containing the form of application and all particulars pertaining to the corps, may be obtained on application to the Surgeon-general, U. S. Navy, Washington, D. C.

EXAMINATION OF DENTISTS FOR THE U. S. ARMY.

THE Surgeon-general, U. S. Army, announces that examinations for the appointment of acting dental surgeons will be held at Fort Slocum, N. Y.; Columbus Barracks, Ohio; Jefferson Barracks, Mo.; Fort Logan, Colo.; and Fort McDowell, Cal., on Monday, October 18, 1915.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S. Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and twenty-seven years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Acting dental surgeons are employed under a three years' contract, at the rate of $150 per month. They are entitled to traveling allowances in obeying their first orders, in changing stations, and in returning to their homes at termination of service. They also have the privilege of purchasing certain supplies at the army commissary. After three years' service, if found qualified, they are promoted to the grade of dental surgeon, with the rank of first lieutenant, and receive thereafter the pay and allowances appertaining to that rank.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination. Early attention is therefore enjoined upon all intending applicants. There will be twelve vacancies to be filled.

ARMY DENTAL SURGEONS.

MEMORANDA OF CHANGES.

For the week ending August 14th:

First Lieutenant C. DeW. Deyton, upon arrival in United States and upon expiration of leave of absence granted him, will proceed to Fort Williams, Me., for duty.

First Lieutenant L. C. Ogg, upon arrival in United States and expiration of leave of absence, to Fort Totten, N. Y., for duty.

First Lieutenant J. F. Feely, upon arrival in United States and expiration of leave of absence, assigned to Douglas, Ariz., for duty.

First Lieutenant J. W. Scovel, upon arrival in United States and expiration of leave of absence, to Fort Sill, Okla., for duty.

First Lieutenant B. C. Warfield, upon arrival in United States and expiration of leave of absence, to Columbus Barracks, Ohio, for duty.

First Lieutenant Mortimer Sanderson, upon arrival in United States and expiration of leave of absence, to Letterman General Hospital, Presidio, San Francisco, Cal., for duty.

First Lieutenant W. H. Chambers, upon being relieved at Letterman General Hospital by Lieutenant Sanderson, will proceed to Fort Huachuca, Ariz., for duty.

First Lieutenant W. A. Squires, upon arrival in United States and expiration of leave of absence, will proceed to Fort Leavenworth, Kans., for duty.

First Lieutenant H. G. Voorhies, upon being relieved at Fort Leavenworth, Kans., will proceed to Fort Barrancas, Fla., for duty.

For the week ending September 4th:

Acting Dental Surgeon J. H. Hess, Med. Corps, by par. 5 S. O. 187, West Department, August 20, 1915, upon arrival at Seattle, Wash., from Alaska, will return to station at Fort Douglass, Utah.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING AUGUST 1915.

August 3.

No. 1,149,016, to FRANK L. ARGALL. Artificial tooth.

No. 47,669, to WM. J. HUNT. Design for tooth-brush.

August 10.

No. 1,149,239, to JAMES L. WILLIAMS. Crown tooth and pin therefor.

No. 1,149,376, to WM. A. LEONARD. Material for cleaning teeth.

August 17.

No. 1,150,102, to JAS. ROBERT CRUIKSHANK. Process of casting dental plates.

August 24.

No. 1,150,879, to MATTHEW PAYNE. Dental syringe.

No. 1,151,200, to ARTHUR S. LEVY. Dentist's anvil.

No. 1,151,252, to CHARLES J. EMERSON. Dental matrix-retainer.

No. 1,151,253, to CHARLES J. EMERSON. Dental matrix-retainer.

No. 1,151,352, to CARROLL H. FRINK. Art of introduction and retention of dental filling materials.

No. 1,151,361, to W. LEE HUNTER. Dental jig-polisher.

August 31.

No. 1,152,122, to ORIN C. SAMPHERE. Connecting-bracket for dental handpieces.

No. 1,152,281, to GARFIELD H. BRETSCH. Dental instrument.

No. 1,152,317, to ERNEST ATHEL HEWES. Dental vulcanizing flask.

THE

DENTAL COSMOS.

VOL. LVII. NOVEMBER 1915. No. 11.

ORIGINAL COMMUNICATIONS.

EMETIN IN THE TREATMENT OF PERIDENTAL SUPPURATIONS.

By ALLEN J. SMITH, M.D., and M. T. BARRETT, D.D.S., M.S.,
Philadelphia, Pa.

FROM THE PATHOLOGICAL LABORATORY OF THE MEDICAL SCHOOL OF THE UNIVERSITY OF PENNSYLVANIA.

(Read before the Susquehanna Dental Association of Pennsylvania, at its annual meeting, Wilkes-Barre, May 18, 1915.)

THE announcement by the writers (DENTAL COSMOS, August 1914) before the Pennsylvania State Dental Society, in July 1914, of their belief that certain amœbic parasites of the mouth—*Endamœba gingivalis,* Gros—are of important pathogenic significance in relation to pyorrhea, and that the local instillation of a one-half per cent. solution of emetin hydrochlorid into the pyorrhea lesions in which these parasites are found is followed by the disappearance of the amœbæ and by cessation of the peridental suppuration, has been met in the intervening months with no little interest on the part of both the dental and medical professions, and has excited considerable comment, both adverse and favorable. It is scarcely profitable at this time, with less than a year as yet elapsed, and with many related aspects of the general problem as yet untouched, to attempt any final conclusion regarding the propositions indicated in our preliminary report and in succeeding publications (DENTAL COSMOS, August, September, and December, 1914; *Journal of the American Medical Association,* November 14, 1914; DENTAL COSMOS, February 1915; *Oral Health,* April 1915), but it may not be regarded as disadvantageous to present here a brief review of the subject of amœbic pyorrhea and its probable relations to other forms of suppurating lesions likely to be confused with it in practice, and to repeat, in summary at least, the position of the writers upon this question, especially as we believe we are, by some persons at least, misapprehended.

SCOPE OF WRITERS' INVESTIGATIONS.

At the time this work was undertaken the rôle of the parasitic amœbæ of the

mouth, long known but little regarded, was generally looked upon as of no pathogenic importance. They were regarded as entirely harmless commensalists; little knowledge of their extremely common occurrence was possessed either by zoölogists or by the medical and dental professions. Our investigations were projected primarily with a view of studying the occurrence and relations not only of these amœbæ, but of other protozoa of the mouth as well, with no more than a general suspicion that they might be found of less harmless capacity than had heretofore been supposed. The first observations were purposely, however, made among the inmates of the insane department of the Philadelphia Hospital, because of the frequency of peridental suppurations observed among such populations, and because their isolation insured an opportunity of following the cases closely and of correlating the results of study with the lesions found. The early realization of a high coincidence of the amœbic parasites with Riggs' disease—uniform occurrence of the parasites was observed in the original cases of our first series—naturally led to the institution of control observations upon the detritus collected about the necks of the teeth in normal mouths. Some little difficulty was had in finding such perfect mouths, but seven were examined and found free from amœbæ, and offered as control evidence in the preliminary report. Unable then—and now—to isolate and cultivate these organisms for purposes of inoculation experiments looking toward the fulfilment of Koch's postulates, and having in mind the efficiency *in vitro* and *in vivo* of emetin hydrochlorid as an amœbicide and as a remedy in amœbic dysentery and its complications, we made use of this agent in the hope of destroying the parasites in the lesions, and of thus learning whether after their disappearance any favorable changes would follow in the lesions themselves. Such a mode of approaching the subject, while not ideal, could not logically be neglected when we were not able to follow the classical procedures for absolute determination; moreover, in other diseases, as in malaria and amœbic dysentery, identical or precisely analogous lines of conclusions, and in some far less satisfying, as in case of lepra, have had generally a tentative approbation. Up to the time of presenting our original report, thirteen cases had been subjected to instillation of the emetin hydrochlorid solution into the pyorrhea pockets without other treatment, all at the time of report being either entirely freed from active suppuration and peridental inflammation or materially improved. In presenting our preliminary report we asserted our belief that these amœbic parasites are not harmless, but that they bear an important pathogenic relation to pyorrhea, and in proof thereof we offered the uniformity—as then observed by us—of their occurrence in pyorrhea pockets and their absence from mouths free from peridental suppurative foci, the fact of their disappearance under the influence of emetin hydrochlorid, and with their disappearance the cessation of suppuration, the return of the gums to normal appearance—short of re-formation where retracted—the tightening of loosened teeth, and the subjective appreciation of the improved condition of the mouth by the patient.

SYMBIOSIS OF AMŒBÆ AND VEGETABLE MICROBES.

In this first publication, but with fuller elaboration and with more insistence in our subsequent papers, the writers indicated a belief that the associated micro-organisms parasitic with the amœbæ in the mouth are to be held culpable with the amœbæ, and have urged the idea—unproved as yet—that the amœbæ and some or all of the vegetable microbes maintain a symbiotic life, and are together responsible for the local oral lesions; and that toxic substances probably elaborated by the bacteria are diffused from such oral lesions and become, by their selective influence upon various structures of the body, responsible for the varied arthritic, alimentary, hemic, nervous, and other complications of the oral condition. Such

conception, which we have urged as a provisional or working theory, is to our minds entirely reasonable, and is in full harmony with plans of treatment which are known to have been attended with more or less success. If in association these amœbæ and other micro-organisms are capable of producing the lesion known as pyorrhea, one may with propriety aim his measures so as to destroy either of the associated links of the chain, or to eliminate the entire chain of agents.

EMETIN HYDROCHLORID, VACCINES, AND MECHANICAL TREATMENT OF PYORRHEA COMPARED.

One will in the end approve of that plan of the three possibilities as a routine method which is found most readily and comfortably applied, and which in the greatest proportion of cases proves most efficacious. There is no objection to the use of vaccines, properly selected, prepared, and administered, for the destruction of the bacterial end of the chain, but it is well known that vaccine therapy in pyorrhea, while occasionally followed by brilliant success, is more frequently disappointing and by no means free from objectionable features. If emetin be an efficient amœbicide, as has been well proved in our opinion, there is quite as much rationality in attacking the amœbic link in the symbiotic chain; and our own experience, supported by the experience of many others who have used it in appropriate fashion, would indicate that as a single remedial agent this drug is of high value, and is attended by comparatively trifling discomfort or danger to the patient. But if the mechanically prophylactic dentist actually, under whatever theory he operates, carries out in full measure the removal of all the agents which may be involved, and in so doing is within reasonable limits as to discomfort to his patient and danger to the structures involved, we can have no quarrel with him as to the ultimate results. But a thorough cleansing is so difficult that imperfectness is more than likely to attend the best intended efforts, and there is no operation of the dental office that is ordinarily more dreaded by the sensitive patient than this; moreover, the damage done to the structures, the chance of opening ports of infection to persisting oral micro-organisms, and the occasional effects of fuller absorption of toxic substances not evacuated from the lesions, all make this, to say the least, a mode of procedure not to be chosen as the primary and sole measure for the average case. It would be foolish to deny value to any one of these three modes, or to the use of ordinary antiseptics frequently combined with mechanical measures; but the writers believe that in proposing the use of emetin they have contributed a remedy which, when employed in those cases in which amœbæ are demonstrable in the lesions, should rank as first choice, because of its real value and because of its lack of seriously objectionable features. We cannot and we do not object to the use of vaccines if they really represent the important ones of the vegetable organisms of the lesion, but we believe they are best used after emetin has been employed, and has not at all or but imperfectly stopped the suppuration. In similar circumstances ordinary antiseptics may well find a place as an adjuvant in the treatment of pyorrhea. As for instrumentation, holding to the extreme importance of mechanical rest for loosened teeth and of avoidance of instrumental harm to the diseased peridental tissues, and requiring of the operator that he proceed with caution for these points, there can be no fault found with rational operative measures.

RATIONAL REMOVAL OF TARTAR URGED.

We are disposed to regard the tartar often met along the root in pyorrhea lesions as secondary rather than primary, a calcification of an organic deposit from the pus, following the development of the lesion rather than inducing it or than mechanically separating the peridental tissues and thus deepening the pocket. That such tartar as a foreign material is undesirable for a number of

reasons is entirely plausible, and its removal advantageous, but it should be removed with care, and gently, and there seems no reason at all to proceed to the removal of the cementum and to complete polishing of the dentin of the root. The only way the cementum could possibly become harmful would, it seems to us, be by harboring micro-organic life; if sterile and left in place, it ought to afford a better basis for fibrous adhesion in the healing process than could the polished dentinal surface. We may suggest, therefore, in this connection, that a proper procedure would include for teeth still firmly fixed a complete instrumental removal of all tartar along the root, with as little as possible interference with the cementum; that in case of loosened teeth scaling be postponed until in the course of treatment of the pyorrhea by emetin the teeth become more fixed, and then be practiced with gentleness, a little each day, until removal is completed, coincidently, probably, with the completion of the emetin administration. Cautious use of solvents to soften the tartar and lessen the mechanical force required must within due limit be permissible, and may be judicious if thus employed.

CAUSES FOR FAILURES OF EMETIN TREATMENT.

Unquestionably, an indiscriminate use of emetin has followed the publication of our own papers and those of Bass and Johns, and this has resulted in numerous instances in failure of the expected benefits and sometimes perhaps in exaggerating the possible objections to emetin. Lack of discrimination thus far seems to us to have followed mainly along two lines—(*a*) the use of this remedy in forms of suppurative affections about the teeth in which it should not have been applied with expectation of favorable effects, and (*b*) its use in an improper manner. There may, too, be other phases of this fault in discrimination, as in the matter of selecting a proper sample of emetin, but in this question we do not feel sufficient confidence to write with clarity. However, on so crude a point as that involving the loss of activity of a solution of emetin hydrochlorid through bacterial changes on standing for a number of days before use we are certain, and recommend that solutions be used directly after their preparation. In practice one of us [Barrett] prefers, for convenience in preparing a solution for local application, to dissolve in sterile normal salt solution a one-sixth grain hypodermic tablet in two cubic centimeters of the fluid, making approximately a ½ per cent. solution, this quantity being the limit used in a single treatment of the lesions met in the individual patient—less to be used, of course, when the affection is limited to a few and small lesions.

In deciding the question as to the appropriateness of emetin for a given case, we believe that, irrespective of mere questions of location of the suppuration or the extent of the lesion, the actual finding of the amœbic parasites or the determination of their probable absence should be the basis of opinion. There may of course be individual cases in which, even in the presence of these parasites in the pus examined, some special feature will so overshadow in importance the amœbæ as to make it clear that the use of emetin cannot promise more than partial success, and that another and more radical measure is demanded for the best results. Thus within the last few days one of us [Smith] was asked to examine the pus discharging from a fistula leading down to an unerupted third molar in a woman of about thirty-five or more. Active amœbæ were found, but an X-ray examination showed the tooth embedded in the alveolus in a line parallel with its border, the crown anteriorly, and in front of it an osteomyelitic cavity of half the size of the tooth itself. Whatever might have been advocated in the way of emetin treatment was clearly a matter to be postponed until the extraction of the tooth had been performed; and but a little consideration will suggest other conditions in which analogous decisions must logically be made.

NOT ALL SUPPURATIONS IN THE MOUTH OF AMŒBIC ORIGIN.

It is in pyorrhea proper, in the form beginning from the gingival margin and proceeding down along the root of the tooth, that amœbæ are most frequently met. The mere existence of suppuration in relation with a tooth does not make sure the existence of amœbæ in the lesion and justify the expectation that emetin will be curative, if the writers' views are correct. Primary infection of the pulp, probably usually a hematogenic infection, with extension to form an apical abscess, can scarcely be thought likely to have originally included amœbæ in the infection; and should they be found in such an abscess or in the extensions therefrom, whether ascending along the tooth root or penetrating the alveolar ridge, it is altogether likely that they have entered as a secondary complication. Even if some benefit be gained by the instillation of emetin, the remedy is not likely here to reach the ultimate site of the trouble—to which, too, amœbæ may never have gained access—and in the end disappointment awaits the patient and dentist. The latter should from the first have recognized the infected pulp as fundamental, and should have primarily directed his treatment in the usual modes to its correction.

Further, while a very large number of cases of true pyorrhea are amœbic, it would be unlikely in theory and is certainly contradicted in practice that all pyorrhea lesions contain this form of parasite; and in the group in which amœbæ are not found, certainly some other agency in causation and maintenance of the suppuration is the real object of proper remedial measures, and will probably be better met by other remedies than emetin.

MODE OF APPLICATION OF EMETIN HYDROCHLORID.

The second fault which may underlie failure to obtain beneficial results from the administration of emetin is to be sought in the mode of applying the drug. Of the three modes of employment we have strongly inclined to the local instillation of a ½ per cent. solution of the hydrochlorid of emetin, and we have from the first urged this mode of its use. In our early studies a group of six cases was selected for hypodermic administration of the drug. It was abandoned after a week's trial, because of failure on our part to recognize destruction of the parasites or notable diminution of pus from the pockets, and we have consistently advocated the original local application since then. Others, notably Bass and Johns, have urged the use of the drug hypodermically, and we cannot with our limited experience gainsay their commendations. The remedy should be of value administered in either fashion, but we believe that in uncomplicated cases the local application is preferable, owing to the greater certainty of contact, the actual promptness of results, the complete disappearance of the amœbæ, and the small number of recurrences which we have met after months of observation. When the parasites also exist in the tonsils, or in other peri-oral situations not easily reached by local medication, hypodermic administration, of course, is to be advocated; and doubtless an ideal treatment would for all cases combine both modes of administration. Administration by the mouth in the form of guarded pellets —covered with keratine or salol, or in form of "alcresta ipecac" of Lilly & Co. —has not seemed to offer special advantages, and in the few cases in which we have tried it, has not been followed by results of sufficient benefit to urge its continuance. Whether the increasing number of mouth-washes and other popular preparations containing ipecac or emetin will be found of real value is a matter of uncertainty in our minds. Their status can best be decided after observation of the experience of the many who are daily coming to use them; and as long as these preparations are reasonably compounded and used rationally the trial which is proceeding cannot properly be decried. But until

the result is much clearer than now the writers prefer to refrain from tendering advice *pro* or *con*.

PYORRHEA AS A DISEASE ENTITY.

There is more or less variation in the understanding which different writers express in regard to the term pyorrhea in attempting to apply it to an entity of disease. While the word of course refers to conditions in which there is a flow of pus from about the teeth, yet there are numerous cases in which, the other concomitants following the usual rule, there is comparatively little pus demonstrable in the lesion. In a broad sense, if proper sub-classification be followed, there should be no fixed anatomical limitations—such as would exclude, for example, the more superficial suppurating cases of gingivitis, or even the apical suppurations. They should all be included were the efficient cause a uniform one. But with the well-grounded appreciation that primary pulp and apical suppurations are apt to be purely bacterial, and are probably due in each case to a single type of bacteria, whereas the more common suppurations which descend from the gingival margin are apt to show a marked multiplicity of microbic habitants, it is wise, as is commonly done, to exclude these primary pulp and apical suppurations from a definite pyorrhea group. There is, of course, a difference between a gingivitis and an alveolar pyorrhea, as far as both the patient and the dentist are concerned, but that difference is not marked by a sharp line, the deepening gingivitis shading by inappreciable grades into the alveolar lesion. But there is a difference between a pyorrhea which frankly begins as gingivitis and proceeds to alveolar depth, and a pyorrhea which begins laterally below the neck of the tooth, and in spreading ascends into the gum and then opens into the oral cavity. That difference concerns the primary causation particularly, and may pervade the order of events in its development and to some degree its results. Yet when communication with the mouth cavity is established, the differences which have existed are apt to become of secondary importance, from the common complexity of local infestation that is sure to take place. For us, then, but two basic types anatomically are to be considered, viz, those which represent descending processes from the gum margin, and those which, beginning as suppurating pericementitis of the root, advance by an ascending development. In the first, from the beginning the infection is apt to be complex, in the second type it is apt to be an infection by a solitary species; but in the end the two may merge, and the infection in both when open to the mouth is likely to be complex. Amœbæ are not likely to be present in the second type in the early phases, but eventually they may gain entrance and may take part in the further progress of the affection. It is in the first type, by far the most common, that one would think of them as likely agents in the early phase and as continuing with certainty throughout its course.

TYPE OF PYORRHEA BEGINNING AS A GINGIVITIS AND PENETRATING ALONG ROOT.

Limiting our discussion at this time to this first variety, which begins as a gingivitis and penetrates along the root, the writers wish to state clearly that their contentions cannot be assumed to eliminate from consideration other factors involved in the inception or the course of the lesion. For instance, no one can deny that mechanically an overhanging ledge of salivary calculus can, by firm pressure upon the gum, when the teeth are brought into forcible apposition, push the gingival margin down and produce a slight separation of the gum; or that by foreign objects, as toothpicks, a fish-bone, a bristle from a brush, or by too violent massage of the gums, etc., a slight trauma may be effected, into which infecting agents may with readiness find their way or be driven. In this sense, if desired, such agencies may be insisted upon as etiologic factors, and

one may speak of a gingivitis—with succeeding stages of gingival and alveolar pyorrhea—as being a "calculous" or a "traumatic gingivitis," and a "calculous" or "traumatic pyorrhea." To what extent such agencies are essential for the primary invasion of the infecting influences is open to question, and is in reality of little moment, since it can scarcely be doubted that, where by nature a rather deep gingival groove exists, or where lack of common cleanliness leads to accumulation, the food refuse and oral secretions in this site are apt to harbor a world of organisms, and these in such close relations may either by active motility, the extension of growth, or phagocytic convection gain a deeper level and complete the infection. Doubtless systemic conditions, general toxemias of infections, anemias, pregnancy, metabolic disturbances such as seen in diabetes, gout, and Bright's disease, are of importance, but it must not be forgotten that some of these toxemias may coexist with pyorrhea, because they follow rather than cause it. It is probable, too, that in their etiologic relations they merely influence the course of the existing infection, and are not the primary cause of the pyorrhea. In "diabetic pyorrhea," for example, we believe we see sufficient influence—and we see no more—of the diabetic condition in the fact that the saliva penetrating the pyorrhea pocket, and the blood serum and lymph of the tissue, are hyperglycemic, this sugar excess probably favoring the growth of some of the micro-organisms in the pocket, and in the fact that in diabetes a fault in antibody formation, and hence in protection of the individual against bacteria, has been shown to prevail. But at the last the real exciting agent is the local infection, and efficient local medication will stop the pyorrhea of a diabetic, without the necessity for primary or coincident treatment of the diabetes.

AMŒBIC AND SPIROCHETAL PYORRHEAS.

Granting, then, the contributing importance of such local or general factors, either in establishing the port of infection or in the maintenance of special features favorable to the growth and invasion of tissues by the infecting agent, we prefer to regard the infection itself as the essential and exciting cause of pyorrhea, and to look upon this affection as a local one, with possible systemic effects, rather than as a local manifestation of a general condition. Of what that local infection consists in any given instance circumstances must determine; but certainly, in the earliest as well as in the developed phases of the true pyorrheas the infection is not a simple one. Among the different micro-organisms one or more may be dominant and may impress special characters, which possibly may be striking enough to warrant recognition by special name. In this sense we have proposed for those cases in which the parasitic oral amœbæ are demonstrable in the pus, the name "amœbic pyorrhea;" but while such amœbic infestations, either as early infestations in this type or as secondary ones in the later stages of an upward extending variety, are extremely common, they do not include all examples. We have met with a small number of cases, and other writers have previously mentioned similar instances, in which without amœbæ or with but few amœbæ large numbers of spirochetes—which in our cases we believe were those of Vincent mainly, although of this we are not certain—were present. A rapid onset of the affection, wide extension, rapid and deep penetration along the roots, with marked redness, turgidity, and pain and tenderness of the gums characterized these cases. The local application of neosalvarsan, at first as a dusting powder, later in solution in distilled water, was in these cases followed by prompt improvement and cure. For such cases we believe some special name would be appropriate, as "spirochetal pyorrhea." So, too, exceptional cases may be regarded as due to special bacterial dominance; and all such examples should, in theory at least, be particularly influenced by appropriate vaccines.

SPECIES OF ENDAMŒBÆ, AND THEIR HABITS.

The amœbæ which so commonly infest these pockets are one or the other of two species, *Endamœba gingivalis,* Gros, or *Endamœba pyogenes,* Verdun and Bruyant. Thus far, the second species, best distinguished from the first by its large and chromatic nucleus in contrast to the small and very achromatic nucleus of endamœba gingivalis, has been recorded but a few times, and in our own experience the species of Gros has alone been encountered. Where human beings obtain these parasites is not known. We are disposed to believe with Bass and Johns that they are transmitted from a previously infested mouth, perhaps by the agency of common cups and similar non-living conveyers. At any rate, in their anatomy they are so distinct from the common free-living species that it is not probable that they are taken from indiscriminate extra-corporeal sources. Gaining entrance into the mouth, they evidently are able to some extent to live in the soft white matter about unclean teeth, in the moist detritus in deep gingival grooves, in the crypts of the tonsils, and in analogous situations; and from such primary locations they, with a variety of bacteria, gain entrance to any port of entry about the necks of the teeth and there set up the changes which produce, first a superficial gingivitis, later a deeper and deeper gingivitis, and eventually an alveolar pocket. We have no evidence of these protozoa ever existing alone in such a lesion, nor has it been shown that they alone are capable of pyogenesis. But we do know that they are capable of rapid and complete digestion of red blood corpuscles and less rapid digestion of white blood cells; in other words, that there is no doubt of their intrinsic proteolytic powers. In the course of this proteolysis, which from analogy need not be confined to intracellular digestion, it may be confidently asserted that they produce no inconsiderable amount of digestion products—proteoses, peptones, polypeptids, amino-acids—which are particularly favorable food material for their bacterial associates. In this way they may be thought of as the providers for or cultivators of a more and more luxuriant flora in the lesion, and the resultant enlargement of the lesion does not wait upon a special irritation by the amœba more than that induced by its associated bacteria. But if one may infer anything from the variety of systemic complications which are now and again with reason assigned to pyorrhea alveolaris, it must be clear that the amœbæ alone cannot be charged, since, in the first place, many of these complications are surely of toxic development, and the variability of the group of complications prevents one from recognizing a single toxin as the agent. We know of no amœbic toxins, although we do not, conversely, know that there are none; but one does constantly note in properly prepared specimens large numbers of bacteria of one or another kind in many of the amœbæ, evidently in course of digestion. By such a bacteriolysis the amœbæ may set free, according to the prevailing type of bacteria, now one, now another form of toxin; and if conditions of the wall of the pocket and of the circulation of the patient favor, these may be absorbed, each thereafter affecting the structures of the body for which it has selective affinity. In this manner we may conceive of the importance of these protozoa establishing a symbiosis with a variety of associated micro-organisms, and essential in the prevailing conditions to the maintenance of the bacterial profusion. Whether they could be effective alone we do not know; this can only be determined when they have been successfully grown in pure culture. That, when they are first introduced into a mouth, they persist for any length of time as purely surface parasites and scavengers, is improbable from our rather limited studies of mouths which are free from discernible lesions—to date not less than thirty, all free from amœbæ, as shown by repeated microscopic examination. There might well be fancied such a period of non-pathogenic presence following the primary introduction of the

parasites into the mouth, but as a matter of observation, as far as our experience shows, the finding of these parasites free upon the surface of the teeth and mucous membrane means rather that somewhere there is a pocket of suppuration in which they are multiplying, and from which they emerge from time to time to the free surfaces. Even were they to be found occasionally in mouths free from demonstrable lesions, this would not be of more significance than that *Endamœba histolytica*, Schaudinn, has repeatedly been found in the stools of persons free from dysentery, and no more significant than the finding of pneumococci in the throats of persons who are not suffering from croupous pneumonia. That they are pathogenic in the relation which we have attempted to outline, or perhaps in one more direct and isolated, we hold to be more than a mere plausibility when, as has been amply demonstrated, their destruction by emetin is followed by the cessation of suppuration.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE GERMICIDAL PROPERTIES OF DENTAL CEMENTS.

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(Read before the Connecticut State Dental Association, at its annual meeting, Hartford, April 21, 1915.)

THE object of this paper is to report the findings of a series of experiments carried out with the view of determining the actual germicidal value of representative dental cements. It was undertaken only after careful conclusion that the matter had some important bearing, not only scientifically but also practically, from the standpoint of the patient who may be subjected to dental work.

The cement, according to information received from members of the dental profession, is used extensively for cementation of bridge work, crowns, inlays, and for fillings. In fillings, especially in the teeth of adults, the cavities can be and often are thoroughly cleaned, even rendered sterile, the dental canals being sterilized almost perfectly. Absolute sterilization is, however, almost impossible, except perhaps in the dental canals. In cases where the dentin is exposed, the best form of filling, possibly, is some type or other of alloy. At times, however, copper cement is used in spite of its being somewhat objectionable. In smaller cavities, where the dentin is not exposed, cement is the filling most frequently employed. It often occurs, in deciduous teeth, that the only procedure prior to filling is a thorough drying and the removal of some of the putrescent pulp. The teeth being too sensitive or the patient too irritable, further manipulation is practically impossible and is often abandoned.

In the other forms of dental work, but few precautions as to sterilization are taken. In crown or bridge work, for instance, the teeth are bared almost to the dentin and then usually moistened with some antiseptic, dried, and the caps, filled with cement, are placed over them, no further attempt being made as to antisepsis. Indeed, abscessed and de-

cayed crowned teeth are by no means rare. It would appear, then, that cements of antiseptic, or better still, germicidal qualities are essential.

The various manufacturers have placed what they consider as such on the market, and advertise their respective germicidal qualities in large type. No satisfactory experimental basis for such claims can be found in dental or other literature as far as the writer has been able to ascertain. A short paper on this subject has appeared in the *Dental Review* for June 1914, by Ames. He claims that the principal germicidal action occurs in cements of high copper percentages, and is due to the soluble salts formed with the mixing fluid, which is chiefly orthophosphoric acid. He also claims that the light-colored copper cements do not give this action, or very little of it. It does not appear, however, that he has gone into this matter very extensively, as he mentions but two experiments, upon which he bases most of his statements, and these on the so-called plastic pellets.

A small circular issued by one of the manufacturers, undoubtedly for the purpose of advertising, contains a report from the Mellon Institute of Pittsburgh, and is dated January 25, 1915. In it there is a general review on "The Disinfecting Action of Metallic Copper," with numerous quotations, from the early Hindu writings up to modern times. Toward the end, the author makes a bold statement to the effect that the cement in question contains germicidal properties so long as any portion of it remains in the cavity of the tooth. He mentions no experiments in support of this contention.

During his review of the first copy of this paper a reprint was received by the writer entitled "The Germicidal Efficiency of Dental Cements," from the author, Mr. Paul Poetschke; the paper was published in the *Journal of Industrial and Engineering Chemistry,* under date of March 1915. This paper is interesting and instructive, dealing with the problem along scientific lines. A good part of it, however, deals with the chemical aspect and differences in germicidal actions of various chemical combinations. Its writer takes up the investigation of a number of different cements, making tests both of the powder and firmly "set" pellets, which were ground up before testing. The work was all done on saliva and does not altogether represent the conditions to which these pellets are subjected when in actual use. It is true, as the author claims, that saliva will contain most of the bacteria found in the mouth, but the rinsing of the mouth and chewing of paraffin (both of which were made use of in the technique described) will in the first place wash away numerous bacteria, while the second action will hold many of them in the paraffin, and so cannot represent all forms of bacteria found in the cavities of teeth. It must be pointed out that a serious error in the work as reported lies in the dilution and plating method in determining germicidal action. It is a well-known fact that, when the bacterial count is low, this method becomes valueless for all practical purposes. The frequency with which the figures 99.9 and 100 per cent. of germicidal efficiency appear in the results reported, figures representing only 5 and 15 minutes' exposures, in itself casts doubt upon the technique or its interpretation. Nothing is mentioned concerning the presence of spore-forming organisms in the saliva subjected to these most extraordinary germicidal activities. It is hardly possible that spores were not present in any of the tests made, and if they were, is it possible that they could have been destroyed in such a short time? To put the matter briefly, according to this paper the dental cement is among the most efficient germicides we have, and all the coal-tar products and other chemicals had better begin to look after their laurels!

That this is by no means the case will be shown in the following series of experiments. These deal only with the bactericidal qualities of the cements in question; the physical, chemical, and cementing qualities are not dealt with.

Representative bacteria were selected for this work, and included, at first, the staphylococcus pyogenes aureus, the streptococcus pyogenes and viridans, the bacillus coli, and in one set of experiments the bacillus anthracis. Later the two streptococci were discontinued. It was not deemed advisable to use mixed bacteria from the mouth. This was at first attempted, but in a short time was abandoned because most of the organisms that grow, when taken from the cavities of the teeth, are Gram-positive and Gram-negative cocci and bacilli of various sorts, and can be well represented by the aureus and the colon bacillus. The cultures, when used, were always from eighteen to twenty-four hours old, and were at all times suspended in normal salt solution, from which a definite amount was taken in each experiment, as indicated later. The media employed were the standard media adopted by the Society of American Bacteriologists. Their slight acid reaction does not play an important part, inasmuch as the bacteria used in this experiment grow abundantly on slightly acid as well as alkaline media. Each test, when undertaken, was carefully executed with reference to uniformity of conditions for each of the cements. In the case of mixing fluids, a definite quantity was always taken, which quantity was the same for each fluid. The powders were always weighed on chemical balances in definite quantities. The pellets were at all times freshly mixed. Mixing according to definite weight of each of the fluids and powders was a very tedious undertaking, and in view of the fact that some cements would require more mixing fluid to a given weight of powder, and that, as will be shown later, the inhibitory action depended more upon the amount of mixing fluid used, it was deemed best to rely on pellets of approximately equal size, taking more than ordinary care in obtaining them with uniform amounts of fluids.

The cements selected were as follows: A pioneer and admittedly reliable black copper oxid cement, which boasts of a very high percentage of black copper oxid and extraordinary germicidal qualities. For some reason or other, according to many of the dentists, this cement ultimately discolors the tooth to an almost black color. It was chosen on account of its general use and its big claims, and is here designated as "Cement I." In contrast to this was selected a red copper oxid cement, which claims to be the first of this particular form of cement, advertising a content of a 25 per cent. red copper oxid, and here designated as "Cement II." One white copper cement was selected on account of its claims of germicidal qualities above many others of its class, and here spoken of as "Cement III." A light greenish-yellow copper cement, also claiming germicidal qualities of a high degree, was selected, and will here be known as "Cement IV." Besides these four so-called copper cements, black, red, white, and light-colored, representing four different manufacturers, an ordinary zinc oxid or oxyphosphate cement was chosen as control. This was a product made by the same firm as "Cement II," and is here designated as "Cement V."

The work was divided into series, the first dealing with the inhibitory action of the mixing fluids; the second, with that of the cement powder; the third, with plastic or loose pellets; and the fourth, with set pellets. Another series, which probably comes nearest to the actual use of these cements, deals with the action of cement pellets in extracted teeth. Each series will be discussed separately. Each experiment was repeated two or three times to assure constant results. Variations were carefully recorded and will be mentioned in their proper places.

ANTISEPTIC QUALITIES OF MIXING FLUIDS.

It was deemed advisable from the outset to determine the antiseptic qualities of both the mixing fluids and the powder of each cement before investigating the pellets. These were tested as follows:

Experiment 1. Agar plates were seeded with bacillus coli and staphylo- and incubated at 37.5° C. for twenty-four hours. The fluid, chiefly ortho-

Fig. 1.

Fig. 2.

Fig. 1: Germicidal action of one drop of mixing fluid II, on agar plate seeded with staphylococcus aureus, after 48 hours of growth.

Fig. 2: Areas of antiseptic action of the various cement powders, aureus plate, 48 hours' incubation.

coccus pyogenes aureus respectively, using two to three loopfuls of their sus- phosphoric acid, diffused considerably into the surrounding medium, making

Fig. 3.

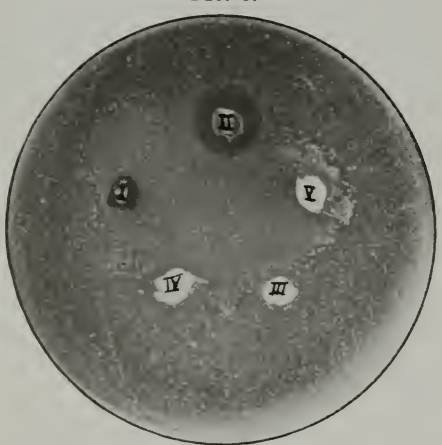


Fig. 4.

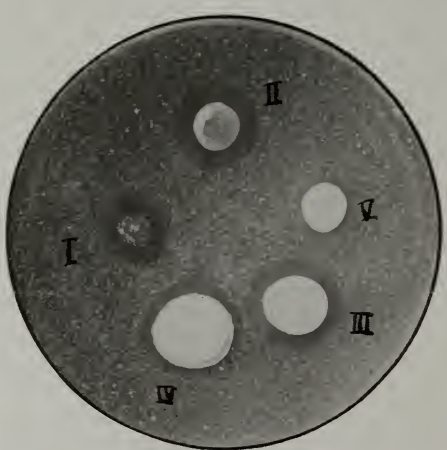


Fig. 3: Second transfer of small portion of the respective cement powders taken from plate of Fig. 2, grown for 48 hours. Shows but a single antiseptic zone, that about cement II.

Fig. 4: Antiseptic areas about powder and water mixtures.

pensions. One drop of each of the five cement fluids was placed on each plate a large circular areola around the drop. (See Figs. 1, 8, and 9.) This area was

gray or blue-gray in color, owing to the action of the acid on the albumin of the medium. It was rather uniform, except at its margins, where it was more opaque. These areas showed effective antiseptic action, all colonies being inhibited in their development. The action was practically the same for all of the cement fluids, and also about the same on both the colon and aureus plates. Observations of the plates were made up to the sixth day, but showed no development of bacterial colonies in these zones.

Experiment 2. To further test out the inhibitory action of the mixing fluids, fifteen tubes of nutrient broth were inoculated with the staphylococcus aureus. A series of tests was then made by dropping into these tubes one, two, and three drops of each of the mixing fluids I, II, III, IV, and V. A similar procedure was carried out with the bacillus coli. All cultures were incubated for ninety-six hours at 37° C. There was no visible growth in any of the tubes, and no organisms were found in stained preparations. Subcultures were made from these broth tubes into agar, and incubated for ninety-six hours, but no growth resulted.

On adding the mixing fluids to the broth, one drop gave a rather heavy turbidity, due to the precipitation of some of the albumins. This turbidity was not so marked in the tubes in which two drops of the fluids were placed, and cleared up entirely in the tubes in which three drops were used. This is due to the fact that the precipitated albumin will redissolve in a more strongly acid solution. The question may arise as to whether the inhibition of growth could be due to a change in the medium and not to the antiseptic action of the phosphoric acid. The following experiment excludes such interpretation: The same series as outlined above was repeated, substituting Naegeli's proteid-free medium for the nutrient broth. No growth was evidenced in any of the inoculated tubes up to the ninety-sixth hour of incubation. Transfers at this time gave no growth on nutrient agar.

Experiment 3. The culture plates of experiment 1 were taken, and inoculations made into agar from the margins of the area of germicidal action. Another inoculation was made one-quarter inch away, and a third one-half inch from the margin. These were incubated for twenty-four hours, and resulted in positive growth in each. This experiment indicates that there is no extension of the germicidal action after the period of first observation, namely, twenty-four hours.

Briefly, it would appear, then, that the mixing fluids of each of the cements have, as far as these tests would indicate, very efficient antiseptic qualities that are due to the action of the phosphoric acid. Further experiments with the mixing fluid will be mentioned later, when comparative germicidal tests are reported on.

ANTISEPTIC QUALITIES OF THE CEMENT POWDERS.

Experiment 1. Plates were made and seeded with staphylococcus pyogenes aureus and bacillus coli. On these were placed 0.2 gm. of each of the cement powders I, II, III, IV, and V, in the form of a circle, after which the plates were incubated at 37° C. Care was taken to spread each cement powder over an area of similar size. After twenty-four hours of incubation, there were striking differences of inhibitory action by the various cement powders. (See Figs. 2 and 10.) Powder II showed the greatest amount of action. There was a clear areola free from bacterial colonies extending all around the small mass of powder, varying in width from 4 to 6 mm. on the colon plate, and from 6 to 8 mm. on the aureus plate. The areola around powder I was, in the majority of tests made, much smaller than that about II, on both the colon and aureus plates. The areola around powder III was about half to two-thirds the width of that seen around II. That of IV, on the aureus plate, was nearly the same width as III, but was much less on the colon plate, whereon the colonies almost came in contact with the powder.

The areola about V was practically the same as that surrounding IV.

Fig. 5.

Fig. 6.

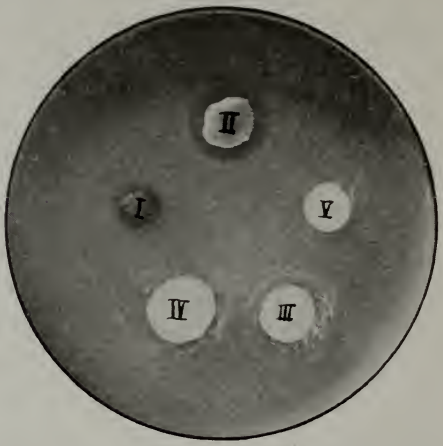
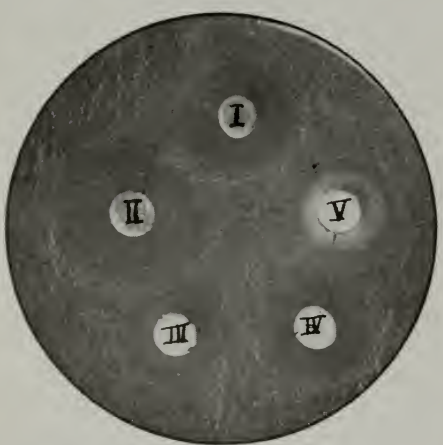


Fig. 5: Areas about plastic pellets II, III, and IV, showing "clearing and crystalline formations" about the two latter.

Fig. 6: First transfer of portions of plastic pellets, after growing six days, showing but a single antiseptic zone, that about cement II.

After six days of growth, observations were made again. The areas of anti-

Fig. 7.



Antiseptic zones about set pellets of the various cements. The action of excess of phosphoric acid is well seen in V, and slightly in III.

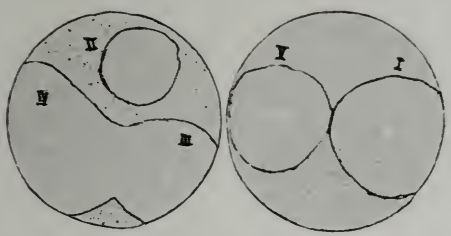
septic action still remained clear about the powders I, II, and V, on both the colon and aureus plates. The area about powder III remained the same on the aureus plate, but on the colon several colonies were found much nearer to the powder, and in places almost in contact with it. This was even more pronounced with powder IV. Here, on both plates, especially the colon plate, the colonies encroached still more closely, and were even found directly under the thinner parts of the powder, when examined under the low power of the microscope. (See Fig. 11.)

The advantage of powder II over the others is shown still more strikingly in the following experiment:

Experiment 2. Plates were seeded with bacillus coli and staphylococcus pyogenes aureus respectively. A small bit of each of the powders I, II, III, IV, and V was taken from the plates of the first experiment after growing six days, and transferred to the corresponding plates (colon or aureus) just made and was incubated at 37° C. for twenty-four hours, at which time they were examined. There was a distinct, clear zone of antiseptic action about powder II, measuring from 2 to 3 mm. on the colon plate, and from 4 to 5 mm. on that

of the aureus. (See Figs. 13 and 14.) This antiseptic zone was not only absent in the cases of I, III, IV, and V, but well-defined colonies were seen directly underneath and adjacent to these powders on both plates. Further transplants were made, using the same bit of powder

Fig. 8. Fig. 9.



Figs. 8 and 9: Action of one drop of each of the mixing fluids.

for the subsequent plates, in order to ascertain the duration of the antiseptic action of powder II, which was evident up to the fifth and sixth transfers. (See Figs. 16 and 17.)

The above experiments were repeated several times, using exact and equal

Fig. 10. Fig. 11.

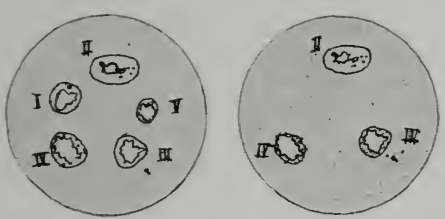


Fig. 10: Antiseptic zones about each of the powders, aureus plate, 24 hours.

Fig. 11: Same plate after six days' incubation, showing numerous colonies encroaching upon the antiseptic zone surrounding cements III and IV.

weights of each of the cement powders, with the same general results.

It becomes obvious, that inasmuch as all powders were tested on the same plates and under the same conditions, no advantage could have been given to one or the other through error or differences in technique, and that all results obtained must have depended entirely upon the particular chemical composition of each cement. The writer desires to emphasize this point, especially in

Fig. 12. Fig. 13.

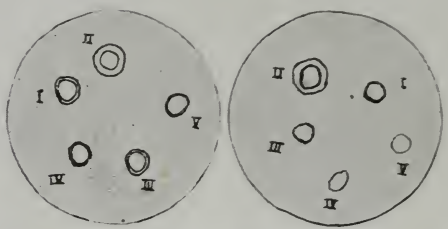


Fig. 12: Cement and water mixtures, aureus plate, 48 hours.

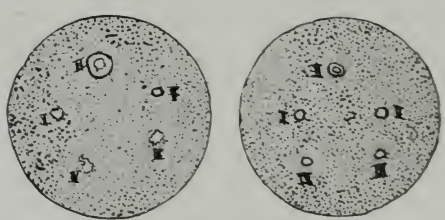
Fig. 13: Cement and water mixtures, colon plate, 48 hours.

Fig. 14. Fig. 15.

Fig. 14: First transfer of cement powders after six days' incubation, aureus plate, 24 hours. Shows but a single antiseptic zone, that about cement II.

Fig. 15: Similar transfer as in Fig. 14, of cement powder and water mixture, after 48 hours of incubation.

Fig. 16. Fig. 17.



Figs. 16 and 17: Third and fifth transfers of the various cement powders.

view of the findings in the experiments hereinafter mentioned.

Experiment 3. Planting from the original plates (see experiment 1) upon

which the different cement powders were placed, after six days of incubation showed good growth of organisms at the margins and also short distances away from the areas of antiseptic action—indicating, as in the case of the mixing fluids, that there is no spreading of the antiseptic or germicidal activities after twenty-four hours.

Experiment 4. The germicidal qualities of the different cement powders were now tested as follows: Two-tenths gram of each of the powders was placed into each of two tubes of nutrient broth; one was seeded with bacillus coli and the other with staphylococcus aureus, and incubated at 37° C. for twenty-four hours. There was no growth present in any of the tubes at the end of this time. A small amount of the fluid was now poured from each of the tubes on to separate agar slants, which in turn were incubated for twenty-four hours. The agar slant made from culture containing powder II remained sterile, but those from I, III, IV, and V showed heavy growths of the bacillus coli and staphylococcus aureus. This experiment shows beyond doubt the superior qualities in respect to its germicidal action of the cement powder II. The original tubes were kept until the ninety-sixth hour of incubation, at which time the remaining cultures also proved negative in the case of the staphylococcus, but still showed weak germicidal action against the colon, as evidenced by the presence of a slight growth on the agar slants. The tubes containing powder II showed a slight greenish-blue color which increased in intensity up to forty-eight hours of incubation. No production of color was evident with the use of any of the other powders. It would appear that this color is due to some soluble substance contained in powder II, probably a copper salt, which enhances its germicidal qualities and which is not present in the other cement powders.

Experiment 5. Inasmuch as each of the cement powders showed germicidal qualities in varying degrees, and since such action can only be brought about by some soluble substance, the writer considered it advisable to make solutions of these powders in plain sterile water, hoping thereby to obtain more striking contrast. Accordingly, 0.1 gm. of each of the powders was mixed in three drops of sterile water, one drop of which was allowed to fall from the end of the spatula on to agar plates previously seeded with the staphylococcus aureus and bacillus coli, and incubated from twenty-four to forty-eight hours at 37° C. The results obtained were as anticipated. The antiseptic zone about the powder-and-water mixture II was at least about double the width of any of the others on both aureus and colon plates. (See Figs. 4, 12, and 13.) The areola on the aureus plate was decidedly larger than on that of the colon. The areolæ about the other powder-and-water mixtures were very small on the aureus plate, and still smaller, at times almost *nil,* on the colon plate. This difference in size of areola evidenced on the plates of the two organisms was constant throughout all the experiments, and simply indicates the greater resistance on the part of this particular strain of bacillus coli as compared with the strain of staphylococcus aureus.

Experiment 6. After three days' growth on the aureus plate, small bits of the powder-and-water mixtures were transferred to a second aureus plate and incubated for forty-eight hours. Only one antiseptic areola appeared, and that about powder II, the others remaining negative. (See Fig. 15.) A second transfer showed that all of the antiseptic qualities of this mixture had also disappeared. The same experiment previously carried out (see experiment 2) with powder II alone showed total disappearance on the fifth or sixth transfer, and would force the conclusion that the water causes a more rapid diffusion of the antiseptic substance.

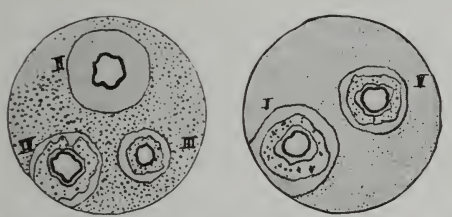
THE ANTISEPTIC ACTION OF PLASTIC CEMENT PELLETS.

The use of these cements being advised in crown and bridge work, aside

from their general use for fillings, the writer thought it advisable to carry out some experiments with loose or plastic mixtures such as are used for the purpose indicated.

Experiment 1. Loose pellets of equal size of cements I, II, III, IV, and V were made up, the consistence of which was such as to permit their dripping off from the spatula. Agar plates were made with the bacillus coli and also with the staphylococcus aureus, and the pellets allowed to drop on to the plates, which were then incubated for twenty-four hours. At the end of this time, the aureus plate showed a large areola surrounding pellet II, varying from 12

FIG. 18. FIG. 19.



FIGS. 18 and 19: Germicidal action of the various plastic pellets, aureus plates, 72 hours' incubation. Shows "clearing and crystalline formation" in all but cement II.

to 14 mm. in width, and of grayish-blue color due to the action of diffused phosphoric acid or soluble phosphates on the medium. (See Figs. 5 and 18.) This area remained intact and showed no growth therein up to the seventh day of incubation. At the forty-eighth hour there appeared an intense green color immediately about and underneath the pellet, due to some copper salt formed by the action of the phosphoric acid of the mixing fluid and the red copper oxid. Pellet I caused an antiseptic area of about the same size or even larger. (See Fig. 19.) This area was somewhat more opaque than II, and instead of remaining intact, seemed to clear up midway between the pellet and its periphery. A number of small round or irregular specks appeared that resembled colonies of bacteria to the naked eye, but which under the microscope appeared as small masses of crystals. Cultures taken from these small specks were negative. There was likewise no growth in this areola up to a week of incubation. Green pigment was observed only occasionally, and when present was slight in amount and confined under, and never surrounding, the pellet. This might be due to either copper or cobalt salts, both of which are present in the cement, as claimed by the manufacturer. The areola about III, IV, and V were all smaller in size than either I or II, measuring from 9 to 12 mm. in width. (See Figs. 5, 18, and 19.) With each of these, as in the case of pellet I, there was a clearing-up of the areola, and the same crystalline bodies made their appearance in from eighteen to forty-eight hours. This clearing up of the areola, in all of the loose mixtures except II, started as a rule shortly after twenty-four hours of incubation, at times being already visible within the first eighteen hours; it spread until most of the areola became clear, and was accompanied by progressive increases in the crystalline bodies. It appears as if this clearing and crystal formation is due either to excessive phosphoric acid, or to a poor chemical combination which takes place in the loosely formed pellet, since neither of these phenomena were observed with the set pellets to be described later.

Except for the size of areola formed about each of the cements, the plates seeded with bacillus coli were the same in all respects, including the clearing and crystal formation, as those of the staphylococcus aureus. The zones of antiseptic action around all of the loose pellets were smaller than around those of the aureus plate, the variations being in the same proportion as heretofore mentioned.

Experiment 2. After seven days of incubation, portions of each of the pellets were transferred to freshly inoculated agar plates, similar to the procedure outlined in the experiments with the cement powders. After twenty-four hours, pellet II gave a distinct zone of antiseptic action measuring from 4 to

5 mm. in width. Pellet I gave but a small areola, often but a mere trace. There was but a trace (more frequently none at all) of such a zone around pellets III, IV, and V. (See Figs. 6 and 20.) In fact, in these latter the bacteria were seen to grow right up to and even under the respective pellet. On the second or third transfer, pellet II also lost all of its antiseptic qualities, and the colonies of bacteria were found to come in contact with it.

Experiment 3. This experiment was carried out with two points in view: First, it was considered that the large areola of antiseptic action obtained in experiment 1 might be due to an excess

Fig. 20. Fig. 21.

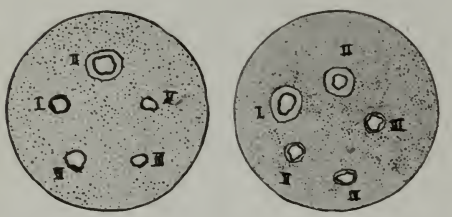


Fig. 20: First transfer of plastic pellets, aureus plate, 48 hours, showing but a single antiseptic zone, that about cement II.

Fig. 21: "Washed" plastic pellets, aureus plate, 24 hours' incubation.

of phosphoric acid, and second, in order to simulate conditions in the mouth, where there is usually an alkaline saliva that would extract and neutralize the acid of such a pellet. Accordingly, this series of experiments was carried out in exactly the same manner as experiment 1 of this section, except that the pellets were "washed" in several changes of an alkaline solution for twenty-four hours before placing them on the inoculated plates. The alkaline solution used was intended to approach as near as possible the composition of normal saliva, and had the following formula:

Potassium carbonate,	0.3
" chlorid,	0.5
Sodium carbonate,	0.5
" chlorid,	0.2
Distilled water,	1000.0

The washing was carried out in test tubes at both room and incubator temperature for from twenty-four to forty-eight hours. Each pellet was covered with about 15 cc. of solution, which was changed several times during the period of washing. The action of the alkaline solution on these pellets, also on set pellets to be mentioned later, was evidenced in a very few minutes, by the dense precipitate formed. The results obtained were striking. On the aureus plate, both I and II showed distinct antiseptic areolæ of from 2 to 3 mm. in width, whereas III, IV, and V gave merely the slightest evidence of such zones. (See Fig. 21.) On the colon plate, both I and II showed but slight zones; the others remained practically negative.

The results of the experiments in this section showed slight variations, such as differences in the size of the antiseptic areas, and occasionally the failure of "clearing" and crystal formation in the case of pellet I.

Summing up, then, the experiments as far as we have gone, it appears that the mixing fluid of each of the cements has fair and more or less uniform germicidal properties. The powders, likewise, have slight germicidal properties, more marked in the red copper oxid cement II than in the black oxid cement I, and more marked in either of these than in any of the other cements worked with. This action, in the case of the powders, must be due to some soluble substance contained in them. This substance is readily used up in all of the cement powders except in II, where it often persists up to the fifth and sixth transfers on fresh media. As to the loose or plastic pellets, it appears that the greater germicidal action is due almost entirely to the excess of phosphoric acid, and when "alkali-washed" pellets are used this action is reduced to almost nothing, except in the cases of I and II. Again, that pellet II forms a considerable amount of intense green pigment about it, which no doubt enhances its germicidal quality when used in cavities or in bridge work, and which is due,

most likely, to the germicidal quality of the copper salts formed.

THE ANTISEPTIC ACTION OF SET CEMENT PELLETS.

The experiments in this series were carried out in exactly the same manner as already described. The pellets were made, using three or four drops of mixing fluid and enough of the respective powders to make a firm mixture, one that properly "sets." The pellets were made of as nearly the same size as possible, and flattened by pressure of the spatula at the time of setting. In case of cement I, the special method of mixing advised was adhered to. This, it may be stated, gives an advantage to cement I over the others, inasmuch as it contains in proportion to the amount of cement powder an excess of mixing fluid. A silver spatula and glass slab were used, care being taken that they be thoroughly cleaned and dried before mixing each cement. The plates were seeded and poured, and all of the pellets were placed thereon at precisely the same time, so as not to favor the action of one more than another. Special attention was given this series of experiments, for it was believed that the hard cement pellet represented the state of the cement as it is placed in the tooth cavity by the dentist.

Experiment 1. Rounded set pellets of each of the cements were freshly made and placed on both aureus and colon plates, and were incubated for twenty-four hours at 37° C. The results obtained in a general way showed the same differences as were seen in the previous tests. (See Figs. 7, 22, and 23.) Cement II showed a large clear zone of antiseptic action. The pellet was surrounded by a narrow ring of opacity due to the diffusion of some of the mixing fluid set free from the pellet. At the end of forty-eight hours there was also present a distinct ring of intense green color around and underneath the pellet. The area produced by cement I was about the same in size, at times smaller, and often even larger, but there was considerably more of the phosphoric acid given off with this cement than in case of II. There was, as a rule, no evidence of any green color about the cement pellet I, but occasionally a little greenish discoloration was seen underneath the pellet. The antiseptic areas surrounding III, IV, and V were all smaller than in either I or II. These were in general about the same size; often, however, that surrounding V was larger than either in III or IV, and almost invariably that of IV was the smallest of the three. Here, also, most of the germicidal action appeared to be due to the phosphoric acid set free.

FIG. 22. FIG. 23.

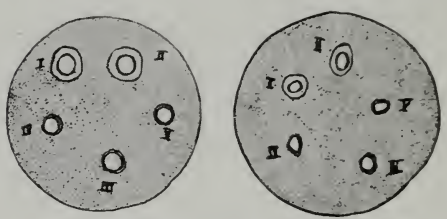


FIG. 22: Antiseptic zones about the various set pellets, aureus plate, 48 hours.

FIG. 23: Same on colon plate. (Compare with Fig. 22.)

As already stated, the inhibitory action of the mixing fluids, whether due to phosphoric acid or other soluble salts, was excellent. It would appear, then, that in the mixing of these set pellets, though all of the fluid is apparently used up, yet chemically only a certain amount of it is utilized, the excess being given off to the surrounding medium and playing an important part in the antiseptic action produced.

The results obtained on the colon plates were as might be anticipated from the differences between the aureus and colon plates in the foregoing experiments. The zones of each of the cements I and II were somewhat smaller, but those of III, IV, and V were only one-third the size of their respective zones on the aureus plate. Here also the liberal diffusion of phosphoric acid was present.

Experiment 2. Transfers of the pellets from the plates of the first experiment were made after six days of incubation, on to freshly inoculated plates, to determine whether or not the pellets were capable of further antiseptic action. These plates were incubated as usual. The results obtained were similar to the experiments already described with the use of the cement powders and the plastic pellets, namely, that transferred pellet II gave a distinct ring of germicidal action on the first and often the second transfer. (See Fig. 24.) Pellet I gave a small ring in only one of four experiments, and that in the first transfer only; the remaining cements gave none, even on the first transfer.

Fig. 24. Fig. 25.

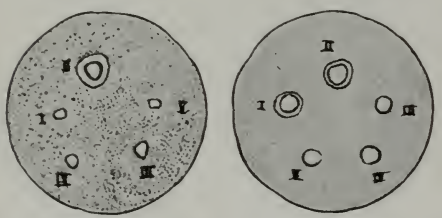


Fig. 24: First transfer of set pellets, aureus plate, 48 hours' incubation.

Fig. 25: "Washed" set pellets, aureus plate, 48 hours' incubation.

Experiment 3. Cultures made from the margins of each of the germicidal areas, after twenty-four and forty-eight hours of incubation, to test out the possible extension of germicidal activities beyond that evidenced after twenty-four hours, proved positive—thereby indicating, as in previous experiments, that practically all the antiseptic action under these conditions takes place within twenty-four hours. Here must be pointed out the possible exception of cement II, which always showed further antiseptic action, but only when the pellet itself was transferred into freshly seeded plates.

Experiment 4. The fact that a great deal of this inhibitory action was due to the liberation of phosphoric acid determined the writer to wash these pellets in alkaline solution before subjecting them to the test. The method of washing has already been described. The results were in all respects the same as those obtained with the use of washed loose pellets. Pellets I and II gave distinct and well-marked areas on both the aureus and colon plates; III, IV, and V gave but traces of such areas on the aureus, but were entirely negative on the colon plates. (See Fig. 25.)

Experiment 5. Transfers of these pellets were also made, after four days of incubation, from the aureus plate, and showed distinct zones around II and only occasionally around I, but those about the remainder disappeared. There were no zones about I and II beyond the first transfer with the use of the alkali-washed pellet. It would appear, then, that when the pellets either "plastic" or "set" are washed in alkaline solution, most or all of the phosphoric acid or other salts are extracted and neutralized, with the inevitable result of partial disappearance, as seen in I and II, or total disappearance of their germicidal qualities, as is the more frequent occurrence in III, IV, and V.

The fact that these cements, I and II, particularly the latter, would retain their germicidal action beyond the period of washing in alkaline solution, might be explained either by the presence of chemical substances that could not be neutralized by the alkaline salts used (salts that are normally found in the saliva), or that these cements give off these substances very slowly, and hence their action is effective for a longer period of time. This is particularly emphasized in cement II, where it outlasts any of the others in consecutive daily transfers of either its powder, or plastic or set pellet.

Experiment 6. In order to demonstrate closer comparison between the antiseptic zones produced by the various cements, when mixed to form "set" pellets, the following procedure was adopted: Large thin circular pellets were made, and as they were about to set were cut into two equal parts. Both aureus and colon plates were poured,

and two half-pellets with their flat sides adjacent were placed in the center of each plate. The plates were incubated for forty-eight hours, after which time readings were made. All the possible combinations of these semicircular pellets were made, so that each cement was paired with the four remaining

Fig. 26. Fig. 27.

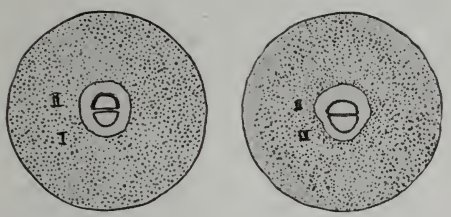


Fig. 26: Semicircular pellet plate, comparison of cements I and II, showing nearly equal antiseptic zones.

Fig. 27: Cements II and IV compared.

Fig. 28. Fig. 29.

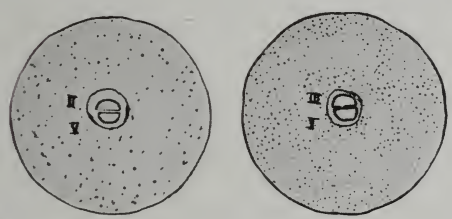


Fig. 28: Cements II and V compared. In both Figs. 27 and 28, cement II far exceeds either IV or V in its antiseptic action.

Fig. 29: Cements III and V compared, showing equal-sized antiseptic rings.

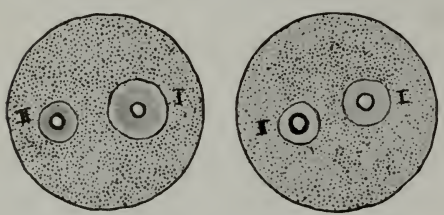
ones. The results were not different to those before mentioned, but were more striking on account of the easier means of comparison. (See Figs. 26 to 29.) Cement II gave uniform results on all plates and with all combinations of the various pellets. The pellet was surrounded at the end of forty-eight hours by a distinct green ring; at times there was also a second narrow ring of bluish gray due to the action of diffused phosphate. The antiseptic zone extended to at least twice the width of the above rings, and well beyond the area of phosphate action. As compared with the other cements, cement II showed the same amount of action as cement I on most occasions; at times the latter surpassed the former, but at such times it was usual to find that such action was due to greater diffusion of phosphoric acid or phosphates. Cement II showed at least twice the amount of action as compared with III, IV, and V. These results were proportionately the same on either colon or aureus plates.

Cement I gave no evidence of any green ring; occasionally, as previously mentioned, it showed a trace of green color directly under the pellet. As can be concluded from its comparison with cement II, it gave three and often four times the amount of action over pellets III, IV, and V. As to III, IV, and V, but a word will describe their relations to one another. Their actions differed but little, and varied slightly, so that at times the action of cement III exceeded somewhat either IV or V, while at other times the findings were reversed. On account of these variations and but slight differences, the writer considers it best to regard these three cements in about the same class when viewed with regard to germicidal properties.

Experiment 7. The question now presented itself whether, in the tests of these pellets, results depended on the powder or the mixing fluid of the respective cement. Accordingly, experiments were undertaken with the view of determining, if possible, which of these it might be, and also as to the effect produced by the interchanging of mixing fluids. Set pellets were made of each cement, using its own mixing fluid, as control, and then with each of the other fluids, making a total of five pellets for each cement powder. These were placed on agar plates seeded with the staphylococcus aureus and incubated for from twenty-four to forty-eight hours, with the following results: Cement II showed the same general results, both in the size of the areola, amount and intensity of the green pigment and in the amount of diffused phosphates with all of the mixing fluids except that of I, which

gave considerably more diffused phosphates. Cements III, IV, and V did not differ markedly with the use of various mixing fluids over those of their controls. It was interesting to note, however, that cement I, which has, as the manufacturers of this cement claim, a special form of mixing fluid, mixed properly only when its own mixing fluid was used. The pellets made by the use of powder I and any of the other fluids were of very poor cementing quality, impractical for the use intended. However, the antiseptic qualities of these pellets exceeded the control in the proportion of two to one (see Figs. 30 and 31), due to the excess of phosphoric acid.

Fig. 30. Fig. 31.

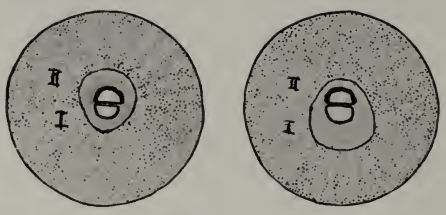


Figs. 30 and 31: Differences in germicidal action of pellets made with cement powders I and II, using their respective mixing fluids as controls (Fig. 31) compared to similar pellets of the same powders with interchange of mixing fluids. (Fig. 30.) Under these circumstances pellet I becomes a pellet of the plastic type, and shows the greater amount of germicidal action, due to the excess of mixing fluid.

Experiment 8. Mention has been previously made that the antiseptic action of cement I at times exceeded that of II, and that this was most likely due to either excess or greater diffusion of mixing fluid. The interpretation was based upon the fact that, when the pellets were washed in alkaline solution the opposite was always to be seen, namely, that cement I frequently lost almost all of its germicidal properties and never approached the activities of cement II.

In support of this contention, the following experiments were also undertaken: Semicircular or double pellet plates were resorted to. Set pellets were made of each of the cements, and cut in two as described in experiment 6. Half a pellet was placed on an aureus seeded plate, and adjacent to this a half-pellet of the same size of a second cement had been placed—which pellet, however, was made with an excess of mixing fluid. The conditions are, then, a half-pellet firmly set made up in proper proportions of powder and mixing fluid, tested against a half-pellet of a much less firm consistence, made up with excess of mixing fluid. The expected and inevitable happened. All of the less firm half-pellets containing excessive fluid surpassed those that were properly mixed and firmly set. To illustrate, cement I could be made to exceed II in the proportion of two to one, and conversely, cement II under these conditions would exceed I in the same or even greater proportion, depending upon the amount of fluid used. (See Figs. 32 and 33.) Cements III, IV, and V could also be forced to exceed I or II by means of the same technique.

Fig. 32. Fig. 33.



Figs. 32 and 33 illustrate the possibility of forcing cement I to exceed II, and *vice versa*, by using an excess of mixing fluid.

Such tests, however, are not to be relied upon, as they do not fulfil the conditions in which these cements find their proper uses. They are recorded here to illustrate the fact that some of the variations heretofore mentioned may be due, partly at least, to almost unavoidable faulty technique, and again, that the utmost care must be exercised that the conditions under which these cements can be compared must be most

exact and carefully determined. The interpretation of the findings will naturally depend upon such conditions in the course of the experiments.

Experiment 9. In order to compare the inhibitory qualities of the cements on anything like a definite quantitative basis, the following set of experiments was resorted to: The bacteria used were the staphylococcus pyogenes aureus and the bacillus anthracis. These organisms were grown on agar slants for twenty-four hours and then emulsified in normal saline solution. Twenty sterile test tubes were placed in racks and arranged into four sets of five tubes each. In the first set of five tubes was placed one drop each of the mixing fluids I, II, III, IV, and V. The same pipet was used, thoroughly washed after each fluid, so that the drops should be of equal size. In the second set of tubes was put 0.2 gm. of the respective powders; in the third, freshly made set pellets of 0.5 gm. weight of each of the cements, and in the fourth, alkali-washed pellets of the same weight, which had been prepared at least twenty-four hours previous to the experiment. The latter pellets were washed in several changes of alkaline solution up to the time they were used. To each of the tubes of this group were added 5 cc. of the suspension of the staphylococcus aureus. To a second similar group, the bacillus anthracis was added in exactly the same amount. To each group of tubes were added as controls one tube of 5 cc. of the respective emulsion containing one drop of 95 per cent. phenol, which makes practically a 1½ per cent. carbolic acid suspension of the organism, a second control tube containing one drop of a 5 per cent. solution of phenol, and a third, the emulsion itself, as control against possible autolysis. All of the tubes were kept at room temperature, and inoculations were made daily from each into agar slants. This was done by pouring the entire contents of each of the tubes on to the agar slant and then pouring it back again, in the belief that better opportunity for growth would be afforded by this technique than by the transfer of a single loopful of the emulsion. The tubes were shaken occasionally in the course of each day so as to enhance the condition for germicidal activity. This shaking was not resorted to, however, in the case of the tubes containing the powders at the time of making test transfers, so as to prevent carrying over any of the powder.

The accompanying Tables I, II, and III best illustrate the results obtained.

TABLE I.—Controls.

Days	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1 drop 95% phenol .	+++	2	1	0	1	0	0
1 " 5% " . .	++++	+++	+++	+++	+++	+++	+++
Suspension control . .	+++++	+++++	+++++	+++++	+++++	+++++	+++++

Figures = actual number of colonies. +++ = heavy growth. +++++ = very heavy growth.

It is to be noted that the germicidal properties displayed in this test are by no means equivalent to the antiseptic qualities seen in the foregoing experiments. The conditions are obviously different. Here we have a much severer test for the cements, that of actual bacterial destruction, whereas in the former experiments they were called on only to inhibit the development of bacterial colonies. Examination of Table II will reveal the fact that none of the series gave negative cultures at the end of twenty-four hours, indicating thereby but weak germicidal action. But one

TABLE II.—Germicidal Action of Cements, Using Suspensions of the Staphylococcus Aureus.

	FLUID.				POWDER.				SET PELLET.					WASHED PELLET.			
Days	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*
Cement I	++	0	0	0	++*	+*	3	0	32	1	0	0	0	+*	16	3	0
Cement II	+	8	0	0	8	0	0	0	14	0	0	0	0	29*	1	0	0
Cement III	++	30*	14*	0	++	+?	0	0	+	3	0	0	0	++	++	++	++
Cement IV	+++	18	1	0	+++	+++	+	+	+++	+++	++	++	++	+++	+++	+++	+++
Cement V	++	10	0	0	+++	+++	++	+	+++	+++	++	++	++	+++	+++	+++	+++

Figures = actual number of colonies. + = slight growth; colonies too numerous to count. ++ = moderate growth.
+++ = heavy growth. * = variable; less growth at times.

mixing fluid showed total germicidal action on the second day, three of them on the third day, and all five on the fourth day of the experiment.

In case of the powders: II gave total germicidal action at the end of the second day. The set pellets gave better results; both cements I and II gave but few colonies at the end of twenty-four hours, and were entirely negative on the second day. Cement III gave but three colonies at this time and was entirely negative on the third day, whereas both IV and V were still strongly positive on the fifth day, when the experiment was discontinued. The washed pellets showed a decrease in action of each of the cements, verifying the results obtained in previous experiments. Cement II gave but a single colony on the second day and none thereafter, and appeared quite distinctly superior to cement I, which was not negative until the fourth day. Washed pellets III, IV, and V still gave numerous colonies at the end of the fourth day, when the experiment was discontinued.

Comparison of this table with that of the control table brings out the fact that the germicidal action of cements I and II were equal to, if not somewhat better than a 1½ per cent. phenol under the same conditions of experimentation. Cements IV and V are to be compared to the cements I and II in about the proportion of 1:20, since these cements about equal that of one drop of the 5 per cent. phenol (which in 5 cc. of suspension would make approximately a 0.075 per cent. phenol solution). Cement III has its position about intermediate between the two classes, but in case of the washed pellet it falls back into the class with IV and V, indicating that all of the material that is germicidal in the set pellet is lost during its exposure to alkaline solution.

Table III shows the uniform negative results obtained when these cements are pitted against bacillus anthracis, and requires but little comment. The explanation is, of course, evident: The germicidal action of the best of the cements being equal only to 1½ per cent. solution

TABLE III.—B. Anthracis.

Cements.	*1 day.*		*3 days.*		*7 days.*	
	Fluid.	Powder.	Fluid.	Powder.	Fluid.	Powder.
Cement I	+ + + + +	+ + + + +	+ + + + +	+ + + + +	+ + + +	+ + + +
Cement II	+ + + + +	+ + +	+ + + + +	+ + +	+ + + +	+ + + +
Cement III	+ + + + +	+ + + + +	+ + + + +	+ + + + +	+ + + +	+ + + +
Cement IV	+ + + + +	+ + + + +	+ + + + +	+ + + + +	+ + + +	+ + + +
Cement V	+ + + + +	+ + + + +	+ + + + +	+ + + + +	+ + + +	+ + + +
Controls:						
1 drop 95% phenol	+ + + + +		+ + + + +		+ + + +	
1 " 5% "	+ + + + +		+ + + + +		+ + + +	
Suspension control	+ + + + +		+ + + + +		+ + + +	

of phenol, is not sufficient to destroy the anthrax spores, even after one week's exposure.

Antiseptic action of the various cements when used as tooth fillings.

Whatever may be said of the foregoing experiments, they are at least interesting, and possibly have more or less scientific value. Their importance and application, however, may not be evident, until we consider the matter carefully, and study the problem presented from the standpoint of the actual uses of the various cements. The question may be asked, and justly so, What reason is there to warrant the conclusion that the same germicidal action, as shown to exist in these cements experimentally, occurs also in cavities of teeth or underneath crowns, etc.—in other words, under conditions for which these cements are intended?

It has been the aim of the writer to simulate mouth conditions in the experiments with alkali-washed pellets, but these also fall far short of the actual condition that may at times be present in the teeth. The conditions referred to in particular are those in which the dentist cannot procure perfectly aseptic operative fields, and where cement is to be used as filling or for the purpose of cementation. For instance, as already mentioned, in filling deciduous teeth, the dentist is many times compelled, on account of tenderness of the tooth or irritability of the patient, to give the cavity but a superficial amount of cleaning, and to fill on top of decayed dentin. This is perhaps not the best practice, but it is nevertheless often resorted to. In such conditions the test of the cement would not be against a single strain of organism, but against numerous bacteria of various forms, of different powers of resistance and varying degrees of virulence or activity.

When used as a filling, a cement may act germicidally in several ways. First, by mechanical means, in filling up the cavity and depriving many of the organisms present from the free oxygen they require for their sustenance. Many of the bacteria found in and about the teeth are strict or obligatory aerobes, and grow but slightly in the absence of oxygen. These would readily succumb without any specific bactericidal action on the part of the cement. Again, the

cement pellet forms a very effective barrier to all forms of nutrition, so that many of the bacteria may succumb on account of lack of nutriment. The amount of nutrition and oxygen brought to the bacteria through the blood supply and dentin of the tooth may be disregarded, as it is almost entirely inadequate. The pellet also acts as a barrier to the proper disposition of the waste products of bacterial growth, which, if accumulated, will act as an inhibitory agent to the further proliferation of the bacteria. It is possible, however, that in the case of certain anaerobic bacteria, which are almost always present along with the aerobic forms, the little nutrition brought to them through the dentin would suffice, and that their bacterial products may also be carried off through this same gateway, hence the process of decay might go on in spite of the presence of the cement pellet. Lastly, we must consider the actual antiseptic or germicidal action of the cement itself.

The relative importance and relations of these various agents to the total germicidal action is very hard to determine, and at best may be but relative. However, it would appear that with everything equal, the stronger the germicidal qualities of a cement as evidenced by bacteriological tests, the more is that cement to be depended upon for local action when used for fillings and sundry purposes.

The following experiments are perhaps as close to the real problem at hand as we can hope to attain. A number of freshly extracted teeth were obtained in small quantities at a time, so as to give sufficient opportunity for work upon them. These were assorted, selecting such teeth as contained suitable and medium-sized cavities, of such shape that a cement pellet would properly hold, and would not permit the entrance of fluids along its margins. A number of perfect incisors were selected as controls. The necessity for the controls was to check up the technique and also to determine the possible presence of bacteria in the dental canals. Twenty-five teeth were used for each of the controls, the experiment being conducted as follows:

The teeth selected were separately scraped with a scalpel to remove all the blood, tartar, and fleshy detritus about its neck and roots, the cavity being left untouched. The cavity was then filled with the cement mixture of heavy consistence, which would set in a very few minutes. The filled teeth were then placed in a sterile Petri dish and kept for the period of time desired for the test. The surface of the tooth was then sterilized by holding it in a pair of forceps, dipping it into alcohol and burning. This was repeated three times, after which the tooth was placed into a sterile mortar and broken open. Small pieces of the tooth lining the cavity were picked up by means of a sterile forceps and dropped into sterile broth, and then incubated for at least seventy-two hours. These pieces were freed from all bits of cement before transferring into the broth, so as to eliminate any possible germicidal action of the cement, beyond that which had already taken place in the tooth cavity.

This technique was employed several times, when it was judged to be faulty—first, in that the dry state was not the one the teeth were subject to in the mouth; and again, because previous experiments showed a marked difference in the action of the cement when washed in alkaline solution. The technique was modified accordingly, and the teeth, after being filled as previously, were placed into alkaline solution of the same strength as in the experiments on washed pellets, and kept at body temperature for the various lengths of time desired. "Haste makes waste," and through an additional oversight nearly sixty teeth were rendered useless by this method of procedure, and this resulted in another modification in the technique. All sixty teeth were contaminated with bacteria of various kinds, derived from the surfaces of the teeth and increased through incubation. This possibly would be of no great moment, inasmuch as the outsides of the teeth were to be thoroughly sterilized before trans-

TABLE IV.—Cultural Results of Extracted Teeth Filled with Cement.

Tooth No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Days	*1*	*1*	*1*	*2*	*2*	*2*	*3*	*3*	*3*	*4*	*4*	*4*	*5*	*5*	*5*	*6*	*6*	*6*	*7*	*7*	*7*	*8*	*10*	*12*	*15*
Controls	−	+*	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	−	−	−	−
Cement I	+*	+	−	−	−	+	+	−	−	−	+*	−	+	−	+	−	+	−	+	−	−	+	+	+	−
Cement II	+	−	−	+*	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−	−
Cement III	+	+	+	−	+	+*	+	−	+	−	+	−	+*	−	−	+	+	+	−	−	+	+	+	+	+
Cement IV	+	+	+	+	+	+	+*	−	+	−	+	+	−	+	+	+	+	+	+	−	+	+	+	+	+
Cement V	+	+	−	+	+*	+	+	+	−	+	−	+	+	+	+	−	+	−	+	+	+	+	−	+	+

+ = Positive growth of bacteria, hence no germicidal action. − = Negative growth of bacteria, hence complete germicidal action. * = Bacterial spores only.

ferring into the broth for the test determination, but one more factor assisted in the disaster. It was thought wise to make microscopic smears of the cavities as controls, and in order to do this a drop of water was placed in the cavity and mixed with the platinum loop, after which a loopful was transferred to a slide for the purpose of staining. It appears that this moistened surface interfered with the proper adhesion of the cement, and the result was that some of the pellets became loosened and others shrunk from the walls of the cavities, thereby permitting the bacteria to gain access into them, where they could not be destroyed by the process of sterilization subsequently used. This would not hold, however, in the case of the controls, which also showed a large amount of growth in the alkaline solution, and which invariably were positive in the test broth tubes, even after thorough sterilization before breaking them in the mortar. Some twenty teeth used as controls gave positive bacterial growth with the above technique, which can be accounted for only by the fact that the dental canals were left open for the bacteria to enter and keep out of harm's way during the process of sterilization, only to appear again in the test broth culture.

The second and last modification followed. The teeth were scraped and cleaned, and the ends of the root or roots were dipped into celloidin so as to close off the dental foramina. The cavities were then filled, no control smears being considered necessary, first because it interfered with the technique, and secondly, because the previous twenty smears made showed nearly the same mixture of bacteria in each, and proved of but little value as controls. After filling the cavities, the teeth were immediately placed in alkaline solution for from twenty-four to forty-eight hours, then dried and kept in a clean Petri dish until wanted. The rest of the technique was identical with that previously mentioned. The teeth were sterilized by dipping into alcohol and flaming at least three times. It was found that this

method rendered the outside of the tooth sterile, and at the same time did not produce sufficient heat to destroy any bacteria that were present in the cavities.

The results obtained are recorded in Table IV. It will be noted that the twenty-five control teeth gave positive cultures upon two different occasions, one of which showed the presence of spores only. These positive cultures obtained from the controls may be attributed to possible contamination through faulty technique, or bacteria may have been present in the canals of the teeth. This latter assumption would be of interest, and even have an important bearing if proven to be true.

Cement II, it will be seen, gave the best results, yielding but 3 positive cultures out of twenty-five teeth tested. A spore-forming organism was found in one of these three. Of the same number of teeth tested, cement I gave positive growth in 11 cases, again indicating that the germicidal qualities of this cement are due more to the phosphoric acid solution than to its cement powder, and when this is washed out by means of the alkaline solution used in the technique, the germicidal qualities are much diminished and fall below that of cement II.

The other three, cements III, IV, and V, gave positive cultures in 18, 20, and 19 cases of each of their respective sets of twenty-five teeth. This indicates that these cements are in very nearly the same class, as far as their germicidal qualities are concerned, and that none of them can equal either cement I or II.

CONCLUSION.

The foregoing experiments, taken as a whole, indicate that there are grades of germicidal efficiency in the cements tested. It appears also that the cements investigated can be divided into two classes, the first composed of those containing red and black copper oxid, which for the sake of clearness may be regarded as class "A," and the second, those of lighter color, so-called copper cements and the ordinary oxyphosphate cement. which may be designated as class "B."

The germicidal efficiency of each of the cements depends considerably on the mixing fluid or some readily soluble substance. This statement is emphasized by the experiments in which either the cement pellet or the filled teeth were subjected to washing in alkaline solution. Under these tests, red copper oxid cement II excelled all others, including cement I, of its own class, showing evidence of but 3 failures in twenty-five teeth tested, as compared to 11 out of twenty-five by the black oxid cement I, its nearest competitor. It is not necessary to draw further comparison between the various cements, since that has been already done in considering each series of experiments.

It appears to the writer that the germicidal action of dental cements, when in actual use, depends on numerous conditions other than the absolute germicidal coefficient of the cements *per se*. It has already been pointed out that the cement pellet may act, in part, as a germicide simply through its mechanical effects. There is no doubt that careful and proper dental technique, that tends to attain as perfect asepsis as possible, will enhance the total results obtained by the dentist. The same may be said concerning the shape and size of the cavity to be filled, the method and manner of filling, etc., it being essential that the filling shall not permit the entrance of bacteria along its margins or through its substance.

The porosity of these cements, their possible expansion or contraction, and other properties of cementation, taken with their particular chemical composition, have undoubtedly some influence on their germicidal efficiency. These matters, both physical and chemical, have already been investigated and reported by numerous individuals interested in the chemistry and actions of cements, and are entirely beyond the scope of this paper.

With all things equal, there can be no doubt that the cement that shows the greater amount of germicidal action in laboratory tests such as are sufficiently severe, may be regarded as the one that would give the best germicidal results when in actual use.

A NEW METHOD FOR INDICATING NORMAL AND ABNORMAL RELATIONS OF THE TEETH TO THE FACIAL LINES.

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(Continued from page 1101.)

(III.)

CAUSES FOR RECURRENCE OF MALOCCLUSION AFTER CORRECTION.

BY applying my method before and after treatment of an occlusal anomaly, especially in Angle's class II cases, we can learn exactly what we have changed in the line of level of the teeth in relation to the other parts of the skull. When we have corrected an extreme class II case with all teeth present and all in alinement, and have made a class I case of it, then it appears to me that in many cases we have allowed a line of level to persist by this class I relation of the teeth that is not in accordance with the correct equilibrium of the teeth and the skull of the patient who originally had a class II occlusion, and this appears to me to be the reason why the teeth in these cases, which seem to be so splendidly corrected, after some years resume their former positions—because this is the exact equilibrium for the teeth belonging to this particular skull. Whether we have succeeded or not in the treatment of a case, one cannot tell immediately after the correction of the case is finished, but only after some years, when nature has had an opportunity to establish the exact state of equilibrium again.

A comparison of the position of the teeth before treatment and immediately after—no matter how successful the correction may be—by means of models constructed on the old plan, is of absolutely no value. The model shows only the changes that took place in the teeth as regards the relative position of the units of the upper and lower jaw, but it shows nothing as regards the relations of the teeth to the skull, and I would not be surprised if, as regards these last-mentioned relations, the cause of those malocclusions lies therein. Probably much can be learned in the future concerning these relations by my method of examination.

WRITER'S SYMMETROSCOPE.

After the top of the model has been constructed, we must consider the migrations of the teeth in the arch in relation to the back plane of the model, that is to say, the migrations of the teeth in cases of mutilation. In order to be able to carry out this examination, which is none other than a comparison of symmetry, I have constructed a new symmetroscope. It was my intention with this instrument to reduce the difficulties encountered with other symmetroscopes, viz, the covering of a thread with the raphe, to do away with the system of the transverse threads and to apply a method by which one can be independent of the eye. This is quite possible, as the top of the model constructed by my method represents a horizontal plane that stands perpendicularly on the median plane. Moreover, with this instrument I wish to make it possible to draw in and around the model the line of intersection of the

median plane and of the different transverse planes with the upper and lower model, while the distance of the transverse planes to the back plane can be taken as one likes, and read off in millimeters. On the rectangular horizontal basal plane of my symmetroscope, seen in Fig. 18, a cross is shown by which the rectangle is divided in halves. A second plane that rests with its base on the basal plane runs parallel thereto, cing-tools stand also perpendicularly to the basal plane. When the bridge stands precisely in the middle of the symmetroscope, the tracing-tool which has been pushed in, scratches along the long arm of the cross on the ground plane. On one of the plates of the metal bridge there is a millimeter scale with the zero point in the middle of the bridge (see Fig. 18). This zero point coincides with the shorter arm of the cross on the basal

Fig. 18.

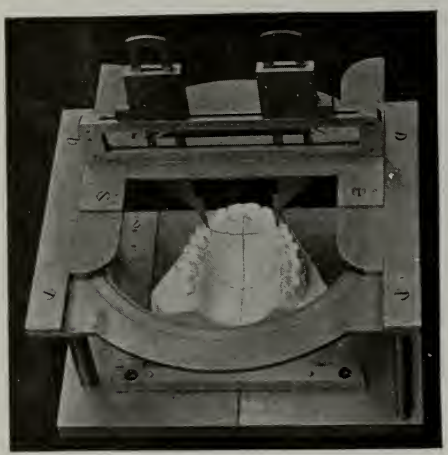


Fig. 19.

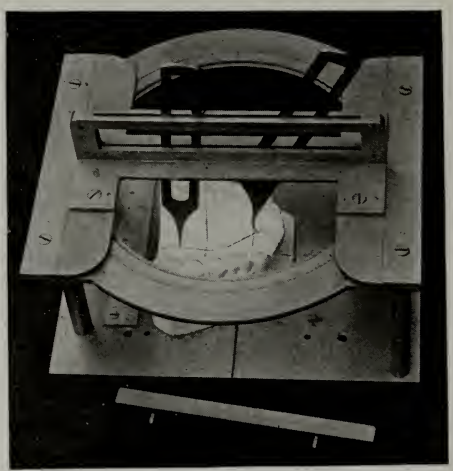


Fig. 18: Symmetroscope—the model being placed with the median line on the short arm of the cross on the basal plane. The bridge is pushed forward, the two tracing-tools indicating the distance from the first bicuspids to the raphe.

Fig. 19: The model placed with the median line on the long arm of the cross on the basal plane. The bridge is placed on the zero point with the two tracing-tools pushed down on the raphe.

and at such a distance that the largest model resting on its back can be placed under the symmetroscope. On this second plane, in which a large circular opening is found, a movable metal bridge is provided, consisting of two plates which run parallel with the long side of the basal plane and which can be moved parallel with the long arm of the cross on the basal plane (see Figs. 18 and 19). Between the two plates of this movable bridge we can now move one or two tracing-tools up and down. As the plates of the bridge stand perpendicularly to the basal plane, the traplane; on the left and right, the distance of the tracing-tool from the short arm of the cross can be read off. On the ground plane parallel with the long side there is a removable metal bar (see Figs. 18 and 19), against which the model with its back plane can lean. Perpendicularly on this metal bar, *i.e.* parallel with the short side of the basal plane, there is a millimeter scale with the zero point at the bar (see Fig. 18); the distance from the bridge as well as from the tracing-tool to this bar can be read off. The procedure now is as follows:

First the top of the model is to be constructed in the *cubus craniophor,* whereby this plane runs parallel with the Frankfort horizontal plane and the median plane stands perpendicularly on this top plane; then one places the upper model with its top on the floor of the symmetroscope (see Fig. 19), and in such a way that the raphe runs in the same direction as the long arm of the cross on the basal plane. Two tracing-tools are pushed down in the bridge, and the model turned on the basal plane so that the points of the tracing-tools touch two points of the raphe. When this is done, one knows for certain that the upper model has been adjusted in such a way under the symmetroscope, that the median plane stands perpendicularly to the basal plane and runs parallel with the long arm of the cross. One can now, in this position of the upper model on the front and back planes, indicate with the tracing-tool where the long arm of the cross on the basal plane meets these planes. If now one places the lower model in correct occlusion on this upper model, and again places the whole model in the correct position on the symmetroscope so that the mark on the front plane and the back plane of the upper model rests on the long arm of the cross, he can scratch a line with the tracing-tool on the base of the lower model, and on the back and front plane of the entire model. Now the entire model is placed on its base, which runs also parallel with the Frankfort horizontal plane in such a manner that the long arm of the cross coincides with the mark on the front and back planes; then one can also scratch a line with the tracing-tool on the top of the upper model. In this way the line of intersection from the median plane is drawn over the whole model. Then only the upper model is placed on its top, or only the lower model on its base under the symmetroscope, so that the lines scratched on the back and front planes coincide with the long arm of the cross; then the tracing-tool scratches the line of intersection of the median plane with the palate on the upper model, *i.e.* the raphe (see Fig. 19) and on the lower model the line of intersection of the median plane with the floor of the mouth, which is the line that Körbitz also seeks by his method. After this, one places the model with its back plane against the bar on the basal plane in such a way that the line of intersection of the median plane with the model runs together with the short arm of the cross on the ground plane (see Fig. 18). The model is now so adjusted that the median plane stands perpendicularly on the ground plane and runs parallel with the short side of the symmetroscope. Now we can move the bridge over the second plane of the symmetroscope, at any distance from the bar on the basal plane which can be read off on the scale on the basal plane, and scratch a line with the tracing-tool over the model. This, then, represents the dissecting line of a transverse plane with the model. Here also we can place the upper or lower model separately on the short line of the cross, and with the tracing-tool draw the transverse lines on the palate and on the floor of the mouth. One can draw these lines at any distance from the back plane or at any point of the teeth, and then read off at whatever distance these transverse lines run from the back plane that represents the zero point. By means of the symmetroscope hitherto used it is absolutely impossible to read off the distance from homologous points left and right of the teeth in relation to the median plane, for the reason that the optical axis of the eye is not in line with the median plane of the symmetroscope. Moreover, the distance to the median plane is read off in degrees by means of the threads running off at a tangent that forms an angle with the median thread. When the model is placed under my symmetroscope with the dissecting line of the median plane on the short arm of the cross, then the zero point of the scale on the bridge lies on the median plane. One has now to move two tracing-tools, that fall with their pointed ends together with the zero point, to the left and right (see Fig. 18), and one can read off in millimeters

the distance from the various points in relation to the median plane. The migrations in relation to the median plane can be examined in each transverse line by pushing the bridge over the symmetroscope.

In this way we obviate with this symmetroscope the "sighting" with threads, and at the same time it is very easy to draw the lines on the model, which with the other symmetroscopes cannot be done with exactness, as the palate forms a curved line. One tracing-tool (see Fig. 19) has a straight point, the other a curved point; with this latter one can scratch a line in places with undercuts. It is obvious that with this symmetroscope it is never possible to follow the raphe with the tracing-tool when a model is placed under it having the top constructed as it has been done hitherto. No doubt one can then touch two points of the raphe, but not three points. When the top is first absolutely correctly constructed, the tracing-tool will then follow the raphe from beginning to end in this symmetroscope.

THE WRITER'S PLASTER PLANE.

In order to trim the planes of the "art" portion of the model perpendicularly to one another, and to make the surface absolutely smooth, I have constructed a planing machine (see Fig. 22) in which a circular plane is turned by means of a motor. In front of this plane, a horizontal metal plate is brought forward by turning a handle. On this plate a cross is drawn one arm of which stands perpendicularly to the revolving plane, while the other arm runs parallel with this plane. On this plate the model, after its top has been bladed off according to the line which has been indicated in the cubus craniphor, is so placed that the line of intersection of the median plane with the model runs in line with the line on the plate that stands perpendicularly to the revolving plane. The model is then fixed on the plate (see Fig. 22). If the model in front of the revolving plane is pushed, this latter shoves off the back or front plane of the model so that it stands perpendicularly to the top and the median plane of the model. The side planes of the model are shaved off in the same way by fixing the model in such a way on the plate that the intersecting line of the median plane falls together with the line on the plate that runs parallel with the revolving plane. To read the deviations of the teeth, we only need the top, the base, and the back plane of the model. The front plane always runs parallel with the back plane and can thus be substituted by the latter as a basis for judgment. In place of the side planes one can take as basis for judgment the median plane which runs parallel therewith. Of the "art" portion of the model we cannot construct the front and side planes, because these project too much, and the model cannot be placed in the facial plaster cast owing to lack of space. The models, therefore, receive the form shown in Figs. 12, 13, 14, and 15.

INSTRUMENT FOR DRAWING THE CURVATURE OF THE PALATE.

In order to be able to draw exactly the curvature of the palate in various directions on paper, I have had an instrument constructed additional to the symmetroscope. The bridge of the symmetroscope is taken away and in its place is put a metal ring that exactly fits in the opening of its upper plane (see Fig. 20). The ring in this opening can be turned in every position, and its position read off on a scale around the opening, the zero point coming to lie on the short side of the cross on the basal plane. Over this ring a bridge can glide to and fro, also consisting of two plates, between which a few hundred thin, smooth-cut metal strips, all of the same length, sharpened at their ends and placed closely together, can be pushed up and down (see Figs. 20 and 21). The upper model is now so placed under the symmetroscope that the intersecting line of the median plane runs in line with the short arm of the cross on the basal plane, and if one turns the ring till the bridge stands on the zero point,

then the metal strips can be pushed down till they touch the raphe. The lower ends of the strips follow the curve of the palate in the raphe, and as they are all of equal length, the upper ends reproduce this curve also. One can draw this curve on a piece of millimeter paper placed behind the strips, or turn around the ring and also the bridge, being able in this manner to draw in each trans-

FIG. 20.

FIG. 21.

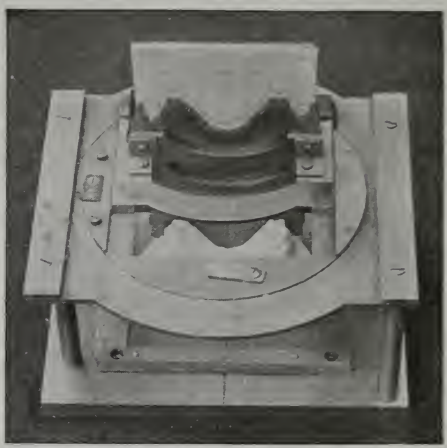
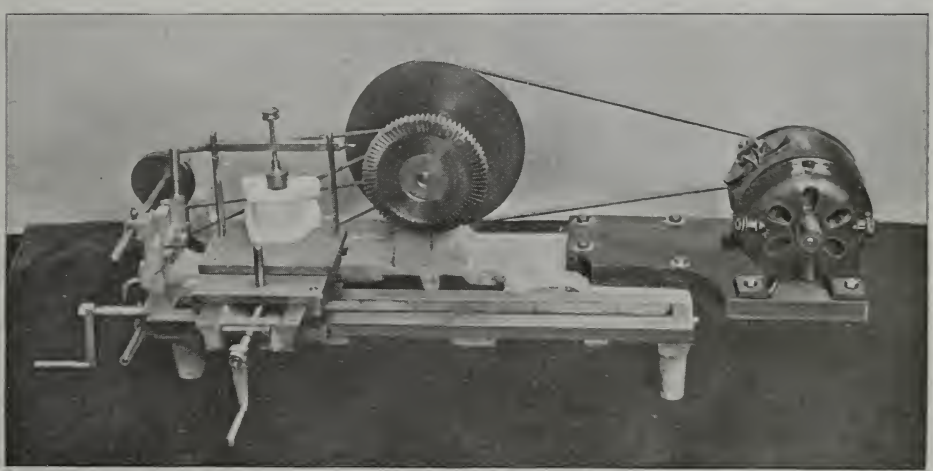


FIG. 20: Ring with movable bridge showing a few hundred metal strips all in line.

FIG. 21: The ring being placed on the symmetroscope, the model is placed with the median line on the short arm of the cross, the strips being pushed down till they touch the palate; the lower and upper ends of the strips indicate the curve of the palate, which is drawn on millimeter paper behind the strips. To show this line the paper is moved upward. The ring can be turned while the bridge with the strips can be moved over the ring to and fro.

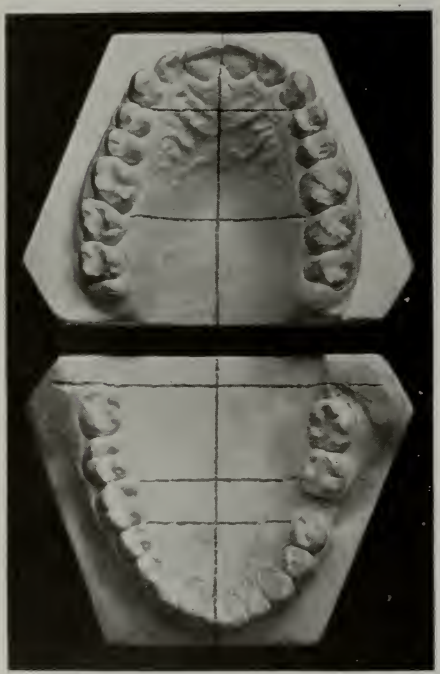
FIG. 22.



Planing machine. The model is mounted on the plate with the raphe standing perpendicularly to the circular plane.

verse line the curve of the palate on paper by moving the bridge parallel with the long arm of the cross on the basal plane and pushing down the strips (see Fig. 21). In this way asymmetries of the palate come plainly into view, and one is able to read off the changes which the palate has undergone by correction of the high palate during expansion. Also in every other direction that is not perpendicular on the raphe the curve of the palate can be found by turning the bridge over the upper plane of the symmetroscope. Fig. 23 is an illustration of the teeth of a patient whose lower left first molar had been extracted in early life. With my symmetroscope, the median line and the various transverse lines are drawn on both models. If one compares the symmetry of the teeth, one notices that in the lower arch the middle has been displaced to the left, as the median line touches the lower right central incisor. If one compares the teeth right and left in relation to one another, then it appears that on the left side the teeth in front of the place of extraction have moved distally, and the teeth posterior to the place of extraction have moved mesially.

FIG. 23.



The model with median line and transverse lines, to show the migrations of the teeth in the lower jaw after extraction of the lower left first molar.

CONCLUSION.

In closing, two illustrations of the same lower arch are presented, in which a right first molar had been extracted (see Fig. 17); on the left side the first and second molars, and on the right side the second and third molars are present, while the place of extraction is completely closed. In the left model the back plane is so constructed that it runs parallel with the distal surfaces of the units of the arch to left and right—that is, of second and third molars—while in the model to the right the back plane is constructed perpendicular to the median plane. In both models the transverse lines are afterward drawn parallel to the back plane. If one places both models with their back planes parallel and compares the curve of the arch, a great difference in the curve is noticed. According to the left model, the judgment is entirely wrong. Also by the transverse lines one sees that the migrations are judged wrongly in the left model, particularly as regards the degree of migration.

By this example it is clear that the construction of the planes of the model is of great importance in judging an occlusal anomaly. In closing the description of my method of objective examination in cases of malocclusion, I believe I have shown that in many ways investigation can be carried out more accurately and more systematically than has been possible hitherto in orthodontia.

The method of examination as before described is based on the observation that a perfectly erect-standing man holds his head in the position indicated

by the Frankfort horizontal plane. In the majority of cases this is true, but in some cases this position deviates from the Frankfort horizontal plane. If one would apply this method more exactly, it is advisable to let the patient keep his head in the natural unstrained position; then to place the cube horizontally over the head and fix three points of the head by means of pointers fastened to the ribs of the cube. Afterward the cube is set on the table and the facial plaster cast placed in the cube corresponding with the three pointers, and one has then obtained the natural position of the head of the patient; the examination is finished as described in the foregoing pages. We are then able to judge whether the Frankfort horizontal plane runs parallel with the physiological horizontal plane, and to compare the condition on the left and right sides.

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Note.—The symmetroscope and the planing machine were made by Mr. W. van der Meulen, instrument-maker at the Dental Institute.

BUCKLEY'S PASTE AS A DESENSITIZING AGENT.

By C. S. VAN HORN, D.D.S., Bloomsburg, Pa.

(Read before the Susquehanna Dental Association of Pennsylvania, at its annual meeting, Wilkes-Barre, May 18, 1915.)

THE main object of this paper is to stimulate discussion on this, the most recent effort of one of our greatest benefactors, Dr. John P. Buckley, that we may get an idea of the results that are recorded up to the present time by the men who have been using it; also to interject a few suggestions which may help in one way or another to facilitate its use and militate against its abuse as a desensitizing agent.

With all innovations we have a probationary period, and in this instance, especially, that period should be governed by an intelligent saneness which may be characterized as the direct antithesis of "rushing in where angels fear to tread." Obviously any method or remedy for the elimination of pain in filling teeth is more or less dangerous when placed in the hands of the profession in general.

The dental pulp is a highly sensitive and highly vascular structure that is keenly sensitive to shock; and whether the shock be traumatic, mechanical, or chemical matters little in so far as its death is concerned, if that shock be sufficiently intense.

TRIOXYMETHYLENE AND ITS ACTION.

Trioxymethylene, the main ingredient in Buckley's desensitizing paste, is polymerized formaldehyd, and formaldehyd is a violent irritant to animal tissue, therefore the use of the paste in all cases of deep-seated caries should be attended by the most rigid care and precaution. In other words, due consideration must be given to diagnosis and to prognosis if subsequent disagreeable complications are to be averted. Buckley says:

> In directing your attention to the use of this new remedy, I wish to emphasize in connection therewith the importance of a knowledge of the anatomy and histology of tooth structure, as well as the pathology of the pulpal organ and dentinal fibrillæ.

Parenthetically, we do not advocate the indiscriminate removal of vital pulps in adult teeth, but we do contend that their removal under aseptic conditions in cases with a clearly doubtful prognosis is to be considered preferable to waiting until the pulp dies and becomes septic.

MODE OF APPLICATION.

As a desensitizing agent Buckley's paste occupies a position peculiarly unique and beyond question, provided it be sealed in the cavity. That is the only objection to its use that we have to record up to the present time, viz, it must be sealed in the cavity. Any of the plastics, preferably one of the temporary cements or temporary stopping, may be used for that purpose. The writer prefers where possible to use either Gilbert's or Fell's temporary stopping; both become very plastic at low heat—Fell's at even a lower heat than Gilbert's—and they are easily and quickly molded into the cavity without undue pressure. They have the additional advantage, if properly manipulated, of forcing the gum tissue away

from the cervical margin of the cavity in those cases where this is necessary, and as a sealing medium they leave nothing to be desired so far as my observations have gone.

Our regular routine consists in excavating and filling the cavity on the day following the application of the paste, but for the following various reasons that procedure is not always possible: (1) It occasionally happens that more than one application of the paste is necessary in order to desensitize all the sensitive area for thorough cavity preparation, this applying more especially to superficial cervical areas, or to cases requiring considerable cutting in sound dentin. (2) Separation of the teeth may be essential to a complete anatomical restoration, and may not have been obtained prior to the application of the paste. (3) Time, either the patient's or the operator's, may not permit its employment.

EFFECT OF THE PASTE.

This brings us to a consideration of two valuable features of the paste. After a few hours, its chemical action seems to cease, but the desensitizing effect lasts for several days, which means that we have ample time in which to do painlessly any operation desired or essential in so far as the cavity to which the paste has been applied is concerned.

It is to be noted that the action of the paste is confined to the tooth area upon which it is placed, and that it has no numbing effect upon the pulp. Buckley says:

> In my clinical experimenting I have, at times, purposely used the paste in cavities of extensive decay, where I suspected the pulp was affected. . . . In those cases where the pulp was exposed, it was found to be sensitive and would bleed freely, indicating, to my mind, that it had not been affected by the remedy.

Placing the paste in a mesial cavity does not desensitize a distal or a cervical cavity in the same tooth, nor will the entire surface of the cavity be desensitized unless the paste is in contact with or has access to the entire sensitive area. According to Buckley:

> The vitality of the fibrillæ is destroyed in the area affected, but the remedy will not affect sound dentin to any dangerous depth. In the preparation of the cavity, in the average case, the dentin affected by the remedy is practically all removed. If it is not, I know from my experience with the paste that the vitality of the fibers is subsequently restored, for after a few weeks sensation returns. While this regeneration of the fibrillæ is being brought about, the tooth may develop thermal sensitiveness, which lasts for about a week.

In view of their vitality being subsequently restored, we are inclined to think that the fibrillæ are paralyzed rather than that their vitality is destroyed.

The writer had an approximo-occlusal gold filling in an upper first molar which had decayed at the cervix, the decayed area being exceedingly sensitive. The filling was removed, and desensitizing paste placed upon the sensitive area only. Two days after the application of the paste all that area was cut away without any discomfort whatever. But when it was found necessary to do some cutting for retention at the occlusal aspect, the dentin was as normally sensitive as though no paste had been used—and it is to be noted that no caries was present at or even near to that point.

PRECAUTIONS.

A precaution that should invariably be observed in restoring cavities with metal fillings is to use non-conducting linings in all those cases which experience has taught us will be sensitive to thermal change. A cavity in which the paste has been used does not respond readily to change of temperature at the time of operating, but it should not be taken for granted that it will not subsequently do so. In fact, we consider it excellent practice to use a non-conducting lining under every metal filling, whether desensitizing paste has or has not been used.

It occasionally happens that after ap-

plying the paste, an uncomfortable feeling in the tooth is experienced; rarely does this amount to a distinct ache, it may rather be characterized as a "growl," and is due, we assume, to the irritating property of the formaldehyd.

In very deep-seated cavities, it not infrequently happens that a major portion of the decay can be removed with but little if any pain, and especially is this so in that part of the cavity immediately over and surrounding the pulp. In all such cases it is advisable to cover the dentin immediately overlying the pulp with some protecting material such as temporary stopping or one of the cavity linings, or both, and then apply the paste directly to the sensitive area. We thus protect the pulp from a too direct action of the formaldehyd, and as a consequence shock through irritation is greatly minimized if not entirely eliminated.

It is really surprising what a small quantity of paste is required to accomplish the desired result. "One grain of the preparation is sufficient for about fifteen applications. On this basis the amount necessary for one application contains neothesin 1/300 grain, thymol 1/270 grain, and trioxymethylene 1/43 grain." (Buckley.) As a precautionary measure, we would emphasize the importance of using only the minimum quantity, but placing that quantity where it is required, keeping in mind constantly that its use should be accompanied with cool judgment and intelligence rather than effusive enthusiasm.

FURTHER CLINICAL DATA NEEDED TO PROVE HARMLESSNESS TO THE PULP.

We would suggest that a complete clinical record be kept of each case in which the paste is used, and especially that specific notation be made of every case with a doubtful prognosis. It is not to be presumed that all the pulps in all the cases in which the paste has been used will remain vital. Pulps have died before the advent of Buckley's desensitizing paste, and will continue to do so. The important problem that we have to solve at this time is, Has the paste any deleterious action upon the dental pulp, and, if so, under what conditions? That cannot be solved by any hit-or-miss procedure of practice, either in the application of the remedy or the records of the cases in which it is used.

Buckley says:

> It is a formula which has been given every test, and which answers every purpose for which a remedy of this kind should be employed. It is an absolute *specific* for hypersensitive dentin, for it will never fail to desensitize the area of dentin immediately beneath the point of application, and it will do so without causing the tooth to ache, to any appreciable extent at least, and without injury to the pulp of the tooth.

Time, together with precise clinical records, will be required to demonstrate the absolute conclusiveness of that statement in so far as the vitality of the pulp is concerned.

CONCLUSION.

Six months' use of the paste by the writer in various cavity conditions, without any unfavorable results, leads to the conclusion that at last we have a formula which as a desensitizing agent is distinctly worthy of a most prominent place in our dental armamentarium. It is not only a wonderful relief to our patients to know that they are going to be practically free from pain during excavating and filling operations, but it relieves the operator of a great burden. Furthermore, its use reduces scientific cavity formation to a reality in all those cases in which heretofore, owing to extreme sensitiveness, a compromise had to be made.

We feel that Dr. Buckley has rendered a service to humanity which the dental profession should not soon forget. He has undoubtedly worked unceasingly to develop and perfect this formula, and it is worthy of prominent mention that he has given it to us "without any strings attached thereto;" therefore we owe him both our moral and financial support.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

A FEW INTERESTING CASES MET WITH IN HOSPITAL PRACTICE.

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THE graduate from the modern dental school has opportunities which his predecessor of a few years ago did not enjoy. Many of our largest hospitals and institutions that care for deformed individuals are appointing dental surgeons to their staffs.

It is only a matter of time, possibly of a few years, when all large hospitals in this country will open their doors to the dental intern. He will be as much a part of a large hospital as is the medical intern at present. The appointing of dental interns to general hospitals is one of the ways in which the dental profession can answer Dr. Mayo's query: "Will the dentists take the next great step in preventive medicine?"

The medical man who is well versed in his work is alive to the important place that dental surgery can play in general medicine and surgery. He has come to realize that many systemic disorders have their origin in the oral cavity, and he will look to the dental profession for aid in eradicating such diseases. It is therefore the duty of every practicing dentist to be fully awake, and to grasp all the knowledge he can of general medicine, so as to be able to co-operate intelligently with the physician.

LACK OF PATHOLOGICAL KNOWLEDGE AND OF APPRECIATION OF ASEPSIS AMONG DENTISTS.

The lack of pathological knowledge and of the practice of asepsis in many dental practices is appalling. One of the best-known surgeons in the city of Philadelphia, a man of international reputation, in speaking before the clinical society of this hospital, said: "The dentists as a class know very little about acute infections of the oral cavity, and less about asepsis." Some of the cases reported in this article will serve to furnish a justification of that statement.

The recent graduate in dentistry has as much to gain by taking an internship as has the medical graduate. To a large percentage of dental practitioners this will appear a rash statement, because their horizon of practice does not extend beyond the insertion of fillings, making plates, and apologizing to the science of extracting. The man who cannot make a reasonably correct diagnosis of a malignant condition in the oral cavity or associate parts is indeed a very poor representative of modern dental surgery. He will never command the respect of his brother the general surgeon. What a broad field presents itself to the everyday practitioner of dentistry to combat malignancy! Instead of waiting to see whether a condition will become malignant, it should be eradicated while in the early stages. Many practitioners of dentistry boast that they never sterilize their instruments, and that they have never had an infection in all their years of experience. It would be of interest to know just how many people have been inoculated with syphilis by this class of practitioners. This is not an extreme theory, but a statement of cold facts, for cases have reported to this and other hospitals, suffering from syphilis, all evidences pointing toward the dentist as the disseminator.

A young man in the prime of life called at a dentist's office to have a tooth extracted. Four days afterward he died from Ludwig's angina. Is it necessary to sterilize extracting forceps?! Practi-

tioners who do not practice sterilization in the fullest meaning of the word are criminals; they are disseminators of disease, and therefore a menace to public welfare.

Baldwin of Chicago reports nine cases of syphilis contracted during dental operations, in two of which cases dentists themselves became infected through carelessness. Farther on in this article a case of syphilis contracted after extraction of a tooth will be recorded. Medical men are constantly berating the dental practitioner for his methods of treating alveolar abscesses. Why is it that so many dental practitioners refuse radical treatment of an acute alveolar abscess, which is undoubtedly a condition calling for surgical interference? When the surgeon decides that there is pus in a patient's abdomen, he does not hesitate to open into the abdominal cavity to remove the pus.

REPORT OF CASES.

Case I. The patient, a married woman, age forty-two, had always been healthy, and had raised a large family. She first complained of toothache in the lower left second molar. The following day her face became swollen, and she sought the advice and services of her family dentist. He refused to extract the tooth while it was in an abscessed condition, advising the patient to use hot packs to the face. This advice was followed at home until the patient became very ill, and the family physician was called, under whose care she remained for three days. The following morning she was brought to the hospital by ambulance as a private patient. Her condition on admission was as follows: Temperature 103° F. The face was markedly swollen on the left side, the swelling extending down the neck and behind the ear. The scalp and forehead were edematous. The left eye was closed, and the lid puffed out to the level of the nose. The cheek was blue, and pitted on pressure. The jaws were tightly closed, and the patient complained of pain in the small of the back, and a severe headache.

The operation consisted in free multiple incisions of the face and neck, and the removal of the offending tooth. Drainage tubes were inserted in the neck, and hot saline applications made. The saline applications were renewed every twenty minutes. Stimulation and continuous enteroclysis was given. The anesthetic used was nitrous oxid and oxygen. For awhile the patient seemed to do well, but relapsed during the night, and died in the early morning.

Case II. The patient, female, age forty-four, was admitted on the same day as case I. The diagnosis was the same with the exception that the abscess was on the right side of the face.

She first complained of pain in the lower right second molar. The following day her face began to swell. She used home remedies for two days, and then consulted a dentist. He refused to extract the tooth while it was in abscessed condition. On the fourth day she presented at the dental dispensary for treatment.

Condition on admission was as follows: The face was very much swollen on the right side, the swelling extending down the neck and behind the ear. The eye was closed, and the lid puffed. The face was just beginning to grow blue; at one spot it was very dark red. The cheek pitted slightly on pressure. The patient looked toxic, and had a temperature of 102.2° F. The jaws held firmly together.

The operation was the same as in case I. Hot saline applications were made, and renewed every twenty minutes. Stimulation and continuous enteroclysis were given. The anesthetic used was ether.

The patient was kept in bed for five days, during which time she was dressed twice daily. At the end of seven days she was discharged from the ward, and referred back to the dispensary for further treatment. She was treated daily, and, at the end of three weeks the incisions had healed entirely, and the false ankylosis was almost gone. When the patient was last seen, some two months after discharge from the dispensary, the result was most satisfactory, in that there was very little disfigurement of the face, and the temporo-mandibular articulation was almost perfect.

Case III. The patient, male, age nineteen, had always enjoyed good health. He had a tooth extracted under a local anesthetic. Several hours afterward he suffered considerable pain in the region of the socket. This gradually spread until his throat was quite painful on swallowing. He applied at the hospital for relief. It was at first thought that he was suffering from a peritonsillar abscess on the right side, on which the tooth had been extracted.

The patient was admitted to the ward, and several attempts to locate pus in the

tonsil were made, but without success. Ice packs were applied externally, and liquid food was given. The patient's temperature rose, and the following morning the floor of his mouth was edematous, his neck swollen, his respiration difficult, and an anxious look on his face. His breath was very offensive, and by the afternoon he had all the symptoms of Ludwig's angina. Incisions were made in the neck along the median line up into the mouth and in the submaxillary triangles, connecting with the median incision. A slight amount of pus was found. Drainage tubes were inserted and flaxseed poultices applied continuously over the incisions. The ethyl chlorid spray applied locally was used as an anesthetizing agent. Stimulants and continuous enteroclysis was given. The patient continued to grow worse; he had considerable difficulty in breathing, developed pneumonia, and died the following day.

Case IV. The patient, age thirty-three, father of three healthy children, had a carious tooth extracted at a "dental parlor." About a month afterward he noticed his gum becoming sore over the socket of the extracted tooth. He sought relief at the same "dental parlor," but in vain, and consequently applied to the dispensary of this hospital. On examination the sore on his gum had the appearance of a chancre. The cervical glands were enlarged on the same side. A Wasserman test was made, and found to be positive. The patient insisted that he had never had any venereal disease, hence it was natural to suppose that he had contracted syphilis in that dental parlor.

Case V. The patient, a boy of eight, developed an alveolar abscess of the lower left first molar. He was taken to a dentist, who refused to extract the tooth until the swelling had subsided. He, however, lanced the gum, but the pus was not in the gum tissue; it was in the jaw-bone. The child had considerable pain, and the swelling in the neck growing larger, he was, on the following day, taken to a physician, who advised the use of flaxseed poultices externally. After the second poultice the abscess broke on the face, just below the mental foramen. The physician irrigated the newly-formed sinus with hydrogen dioxid, and instructed the mother in the use of a small syringe charged with hydrogen dioxid, with which the sinus was to be washed out three times a day.

Under this treatment, together with salves to heal the sinus, the child grew worse; so after three months the mother brought the boy to the hospital for treatment.

The boy's condition on admission was as follows: The face was normal in size, with a large indented area containing a suppurating sinus on the left side below the mental foramen. Examination with the aid of a probe revealed necrotic bone, which the X-ray later confirmed. The sinus discharged a considerable amount of pus daily. Intra-oral examination showed the teeth in a neglected condition, and the lower left first molar badly broken down.

The operation consisted in opening, under ether anesthesia, along the border of the mandible and excising the necrotic bone, which extended back to the angle of the jaw. The tissue was dissected well back so as to give a good flap to expose the area over the sinus. The offending teeth were extracted.

The patient made an uneventful recovery, the wound healing nicely. Two months later a plastic operation was done to improve the appearance of the patient. When seen several months afterward the result was most satisfactory.

Case VI. The patient, female, age twenty-two, had a carious lower left third molar extracted under local anesthesia. The dentist prescribed as a mouth-wash hydrogen dioxid. The patient, having considerable pain in the socket, returned to the dentist for relief. He irrigated the socket with hydrogen dioxid, and instructed the patient to keep on using dioxid. Her face began to swell on the left side, and her jaws became somewhat ankylosed. Two days later, an osteopathic physician diagnosed her case as one of displacement of the cervical vertebra, and treated her three times accordingly. She then consulted a physician, who advised and opened the swelling at the angle of the jaw, obtaining a free flow of pus. The pus continued to drain for three weeks, when it was decided to operate and curet the jaw. This was done, but without satisfactory result. A month later she was operated on again, and the jaw was curetted. The pus, however, continued to flow, and became more vile in nature. The odor was so offensive that the patient refused to see any of her friends.

The patient's condition on admission was as follows: On the left side at the angle of the jaw a large sinus was present, surrounded by scar tissue. The odor was extremely offensive. The orifice of the sinus was about ½ inch in diameter. The patient looked anemic, and some swelling was present at the angle. The flow of pus was yellowish green in nature and profuse. Examination intra-orally showed a small sinus over the region of the extracted third molar. On passing a probe

into this sinus, a distinct gritty feeling was transmitted through the probe to the hand. Examination through the external sinus gave the same sensation. X-ray examination showed a large sequestrum extending from the angle into the ramus.

The operation consisted in thoroughly opening the skin and dissecting back the muscles, exposing the necrotic area. This was removed *en masse*, and the surrounding bone well curetted and irrigated with normal saline solution. The wound was packed with iodoform gauze, drained, and partly closed, dressed twice daily and irrigated with a solution of—

Iodin crystals,	gr. 1
Pot. iodid,	" xv
Zinc iodid,	" xv
Glycerin,	ʒiv
Aqua destillata, q. s. ad	Oj

The patient was given food of a strengthening nature, and when she was able to be out of bed, kept out of doors. In three weeks' time she had regained nearly all her lost vitality, and was brighter in appearance and disposition. The wound healed nicely, and at the end of five weeks was completely healed. Two months later a plastic operation was done and the scar tissue removed, the result being most pleasing to both patient and operator.

Case VII. The patient, a man of twenty-three, presented at the hospital with a large swelling in the submaxillary area. The jaws were tightly closed. He was unable to speak English, hence there was difficulty in obtaining a history. On pressure the swelling was exceedingly hard and painful, though no redness was present. A provisional diagnosis of a submaxillary abscess arising from an infected tooth was made. X-ray examination confirmed this diagnosis, showing that the lower right third molar was the offending tooth. The third molar was lying in a more or less impacted position butting against the second molar. The patient's temperature on admission was 102° F. The following day ether was administered, and the submaxillary area opened and drained by means of a rubber tube. The pus found was streptococcic, and very foul in nature. In the attempt to open the mouth by means of a Mason gag for the purpose of removing the impacted and infected third molar, the left upper lateral incisor was completely dislodged from its socket. Owing to the great amount of trismus present, it was deemed advisable not to force the jaws apart too much, therefore the second molar was removed to give access to the deeply seated third molar, and the patient was allowed to recover from the ether. The pulp of the lateral incisor was removed through the apical foramen, and the root-canal filled; the tooth was then laid in a 1:10,000 solution of mercury bichlorid for fifteen minutes, replaced in the socket, and ligated with a silk ligature to the adjoining teeth, twenty-three hours after displacement. The cervical margin was painted with tincture of iodin twice daily for five days, when the ligatures were changed for metal ligatures such as are used in orthodontia. Coincidently with this treatment of the lateral incisor, the wound in the submaxillary area had healed. It responded quickly to treatment and left very little scar. At the end of three weeks the wound was entirely closed. The ligatures on the lateral incisor were removed, and the tooth was apparently solid in the socket. The patient was seen some five months later, when the lateral incisor was found to be doing excellent service, and the site of operation on the neck to be barely showing.

Case VIII. The patient, male, age forty-seven, presented at the dispensary with a parotid fistula. He had been struck in the face with a piece of metal. The face had started to swell, the eye was closed, and there was severe pain. He consulted a physician, who treated him by external applications for several days. When the patient continued to have severe pains, especially during meal hour, the attending physician decided to incise the face, and, in doing so, cut Stenson's duct, establishing a parotid fistula. Attempts at closure failed and every time the patient smelled a savory dish he had a profuse flow of saliva over the face.

The operation for closure of the wound consisted in making an artificial duct in the mouth just above the normal opening, and connecting this with the external opening. A fine rubber tube attached to the end of a probe was drawn from the outside wound through the cheek into the mouth and secured to the mucous membrane. The external end was cut off short so as to be inside of the facial wound, and directed upward into the duct, and the face was sutured with catgut. Dressings were applied. That night the patient suffered severe pain, and his face swelled up, almost closing the eye on the same side. In the late morning, however, the swelling subsided, and the saliva from the parotid gland commenced to flow through the rubber tube into the mouth. On the eighth day the sutures were removed from the face, and the tube was removed from inside the mouth. The face healed well, and the artificial duct continues to work satis-

factorily. The patient was seen two months later and expressed satisfaction, having had no recurrence of swelling or pain.

Case IX. The patient, a girl of twelve, had a chronic enlargement of the submaxillary gland. On examination intra-orally her first permanent molars were all found to be badly broken down. The root-canals of the left first permanent molar contained pus. As the gland had been in a swollen condition for several months and had been treated externally without avail, it was decided to remove it. The operation consisted in removal of the left submaxillary gland and the roots of the first molar on the same side, also of several other roots in the mouth. The socket of the left molar was well curetted. The gland on examination after removal showed a broken-down caseous condition, but was not tubercular. The patient made an uneventful recovery.

Case X. The patient, a man of forty-three years, first noticed a soreness around the upper left first and second molars. These teeth some few days afterward abscessed, and the patient had them extracted. There remained some tenderness over the superior maxillary bone for some time. About two weeks prior to coming to the hospital, a thick yellowish fluid was discharged from the left nostril. He was treated by a physician for this trouble. His face then began to appear swollen on the left side, but there was no further recurrence of discharge of pus from the nose two months after the first occurrence.

The patient's condition on admission was as follows: He was a well-formed man, his face being somewhat fuller on the left side than on the right, and tender on deep pressure over the infra-orbital foramen. Examination inside the mouth showed the gum tissue to have healed where the molars had been extracted. The left side of the palate was somewhat bulged. X-ray examination revealed an abnormal condition of the antrum, but a decision as to whether it was a sarcoma or empyema could not be arrived at. The patient was etherized, and the antrum opened through the mouth. On gaining entrance to the antrum, it was found to contain pus. There was no sign of malignancy present, so the case was treated as one of empyema. About two weeks after the operation, it was noticed one day, while irrigating the sinus, that a growth had formed. This commenced to grow rapidly, and a diagnosis of sarcoma of the antrum was made. The operation consisted in complete removal of the upper left jaw. The pathological report revealed spindle-celled sarcoma. Nine weeks after this operation an artificial jaw was constructed and fitted, giving the patient great comfort.

Case XI. The patient, a man of forty-seven years, presented at the dispensary with an abscessed second bicuspid. He had a history of pus flowing from his left nostril, and also running down his throat. The X-ray showed empyema of the antrum and necrosis of the alveolar process from the central incisor to the second molar. The patient was etherized, and the central lateral, both bicuspids, and first and second molars were removed. The canine had previously been extracted. The badly necrosed alveolar process was removed from the region of the third molar to the median line. The antrum was opened, curetted, thoroughly irrigated, and packed with iodoform gauze. It required over a month for this case to heal, but at the end of six weeks the tissues were in a healthy condition, and the patient was ready for a prosthetic appliance.

Case XII. This was an interesting case illustrating the formation of secondary dentin. The patient, a little girl of thirteen years, presented with a carious upper left first molar. During the process of excavation the pulp was accidently exposed. A dressing of Black's "1, 2, 3" preparation with ⅛ grain of cocain was applied as a sedative, and the patient told to return in two days. She did not return before the ninth day. On opening the tooth, which had not given any trouble in the interval, a deposit of dentin had been formed over the exposed pulp. This showed up very nicely when illuminated with a mouth lamp. The new dentin was quite firm and of lighter color than the surrounding structure. The cavity was lined with cavitine, a cement step inserted, and the tooth filled with amalgam. Six months later it was still doing good service.

FRACTURED JAWS.

There were thirty-one cases of fractured jaw admitted to the clinic. Two died soon after admission, having received other injuries. With the exception of four cases in which the fragments had not been displaced at all and which were treated by the Barton bandage, the other cases were all treated by means of interdental splints. The results were most gratifying. The method of procedure in constructing a splint is too well known to necessitate a detailed description.

One case of fractured jaw had been wired by a surgeon. The wires were of silver, and passed through the body of the mandible. Necrosis followed, and, when the dental clinic was opened, the case was turned over for dental treatment. The patient was very despondent over his condition, having received the fracture three months before, and the wire operation having failed to give him anything like a firm jaw. He had an offensive discharging sinus on the outside of the face, where the incision had been made to wire the jaw. The patient was etherized and the jaw-bone exposed, the wire and the necrotic bone were removed, and drainage inserted. The following day impressions were taken, and an interdental splint was made and applied. Six weeks later this was removed, and the patient was discharged as cured.

ARTHRITIS AND PYORRHEA.

There were many cases of arthritis which improved greatly after receiving dental attention. Nearly all cases of arthritis were accompanied by pyorrheal conditions. The treatment used in these cases consisted in thorough scaling, free use of tincture of iodin in the pockets, and finally, drying of the gums and applying scarlet red ointment to the pockets. Scarlet red ointment has a wonderful power for causing tissue to granulate. Many cases of spongy gums with pus oozing freely cleared up in a remarkably short time after this treatment.

SECONDARY HEMORRHAGE.

Several bad cases of secondary hemorrhage were treated. The worst and most stubborn was that of a man, fifty-five years of age. Bleeding commenced five days after he had had several teeth extracted under a local anesthetic. The first attempt made to stop the bleeding consisted in packing each individual socket with tannic acid and glycerin on cotton after removing the mass of semi-coagulated blood and thoroughly irrigating the sockets with hot saline solution. This did not give any relief whatever. The patient was admitted to the ward that night bleeding profusely. Each socket was packed with plaster of Paris at 7 P.M., without any result whatever. At 11 P.M. the sockets were again packed with plaster of Paris and cotton, and a wad was placed in the mouth, the jaws were tightly closed, and a Barton bandage was applied. This gave some relief until 2 A.M., when it was necessary to change the wad in the patient's mouth, as it had become saturated with blood. The patient was given at this time 15 cc. of horse serum. At 5 A.M. he had another severe hemorrhage. Another 15 cc. of horse serum was given, and the wad changed. This seemed to control the hemorrhage for a while. Just before noon, however, the sockets were oozing again. This time the plaster of Paris was removed from the sockets, and 30 per cent. argyrol was inserted on a cotton wad, and the head bandaged. This arrested the bleeding. The patient was kept in the hospital for five days suffering from lack of strength owing to the amount of blood lost.

These are just a few of the many interesting cases met with in a hospital. The vast amount of experience obtained in a general hospital both in dental and general medical and surgical work will more than repay the young dental graduate for the extra time spent by an internship. He will complete his term of service with confidence in himself, having acquired sound judgment and valuable practice as a diagnostician.

SUMMARY OF CASES TREATED

From March 1914 to April 12, 1915.

	No.
Patients treated (including return visits)	3654
Extractions	2319
General anesthetics administered	932
Local anesthetics administered	128
Permanent fillings inserted	410
Gutta-percha " (mostly deciduous teeth)	919
Gold fillings inserted	4
Gold inlays inserted	9
Artificial dentures inserted	4
Porcelain crowns	6

	No.		No.
Fractured jaws admitted to clinic	31	Abscess of submaxillary region	18
Comminuted fractures of jaws	3	Thrush cases	2
Oral surgical operations	31	Pathological dentition	23
Alveolar abscess, acute	221	Leucoplakia	6
" " chronic	210	Ludwig's angina	1
Specific lesions of mouth (approximately)	6	Parotid abscess	1
		" fistula	1
Malignant lesions of mouth	10	Dentigerous cyst	2
Cervical adenitis cases	30	Chancre of gum	1
Enlarged submaxillary glands	18	Pulp stones	15
Lacerations of lips	8	Severe secondary hemorrhage	12
Pyorrhea alveolaris	115	Empyema of antrum	10
Gingivitis cases	224	Supernumerary teeth	18
Necrosis of jaws	24	Fungoid pulps (approximately)	34
Root amputation	1	Ranula	2
Implantation of tooth	1	Vincent's angina	1
Facial neuralgia	35	Epithelioma of tongue	3
" " alcoholic injections for same	4	" " palate	1
		" " cheek	1
Impacted teeth removed	15	Sarcoma of antrum	1
Stomatitis cases	61	Case of hemophilia treated	1
Epulis cases	4	Artificial jaw	1

THE PROBLEM OF RETENTION WITH A VIEW TO PERMANENCE OF RESULT AND MINIMUM OF DANGER.

By GEO. NORTHCROFT, L.D.S.Eng., D.D.S.Mich., London, Eng.

(Report presented to Section VI, Sixth International Dental Congress, London, 1914.)

THE words used for the title of this report, while obviously aiming to limit the writer's excursions into the unknown, really cover the whole theory and practice of this most difficult subject. Norman Kingsley called retention the fundamental problem of orthodontia. The permanent maintenance of moved teeth in their new positions unsupported, without having damaged these teeth or their surrounding structures, is indeed the essence of orthodontics, and is of all branches of that science the most neglected and least understood.

It is presumed that the propounders of this problem were aware of its elusiveness, and of the pitfalls that lie in the way of collating all that has been said on the subject up to the present time. They doubtless hoped that the discussion of such a subject by an international audience might throw new light on old problems, and point the way to the conquest of their acknowledged difficulties. Fortunately for the writer this report is supposed only to represent as far as possible the state of knowledge and practice of our profession up to date, and it is specifically requested that known facts only should be dealt with, and speculation avoided.

One difficulty that faces us when studying this problem, apart from theoretical considerations, is that human nature is what it is, and men do not like to acknowledge failure, and from this one fact progress is delayed. It is

forgotten "how far high failure overleaps the bounds of low successes," and had failures to retain accomplished tooth movements by accepted methods been more boldly acknowledged, knowledge of real worth for the benefit of humanity and of the profession would have been more quickly gained. When reading some text-books and articles one might be led to imagine that failure was a thing undreamed-of, and never encountered.

NECESSITY OF EARLY TREATMENT.

Why is the whole trend of modern orthodontics toward early treatment? Because of the unacknowledged failures of the past that have occurred in cases of more advanced age, and in consequence of an examination into some of the reasons for these failures. It has been recognized that treatment should stimulate normal physiological growth at a period when development is most active, and which cannot take place in later life. Failures *in retention* are of course implied, for it is on the capability of the moved teeth to remain in their new positions unsupported that the whole success of any treatment depends.

Statements should not be accepted as scientific unless solidly backed up by incontrovertible facts and statistics, and definite statistics of retention are entirely wanting as far as can be discovered. Men have been content to listen to generalities and possibilities without acquiring a knowledge of certainties. It is only by an exhibition of the truly scientific spirit which moves men to record negative as well as positive results that the profession at large will be definitely able to judge of the reasonableness of a certain line of treatment, otherwise we slip back into the old rut of experiment and disastrous empiricism. Just as the technical details of curative measures against caries have, until comparatively recently, absorbed the attention of the profession to the exclusion of prevention, so the stage in orthodontics has been reached when technical perfection in moving teeth has been very nearly attained, while the factors which contribute to successful retention have received but scant attention.

CRITIQUE OF ANGLE'S CLASSIFICATION.

One must confess with regret that one of the causes of this state of affairs has been the enthusiasm with which the profession has taken up the simple classification adopted by Angle, which, while laying an excellent technical foundation for tooth movement, as everyone now acknowledges, leaves out of consideration all those immensely important etiological factors affecting development, and which does not hold constantly before the eyes of the practitioner the reason why the teeth, or teeth and arches, or arches and jaws, are abnormally placed. The Angle classification has put back the hands of the clock of progress as far as retention is concerned.

The reason why we get successes in retention is because, consciously or not, we have overcome the group of factors which caused the trouble. Why we get failures is because we have looked on classes I, II, III as so many concrete facts, forgetting that class I, II, or III may be described as the expression of a variety of factors acting singly or in groups, and that to accomplish permanent natural retention we must break down the resistance of all antagonistic factors in every group. Angle states that correction would be futile without a removal of the cause: this implies its successful recognition, which is a matter of extreme uncertainty at times. Therefore, as long as etiological problems remain unsolved, so long will our retention of cases involving these problems remain but guesswork.

PRINCIPLES OF RETENTION.

Having acknowledged the general indefiniteness of the present condition of retention, we will consider the lines on which an inquiry may be conducted to elucidate the problems which so often hamper us in making our results "permanent with a minimum of danger."

Retention is effected by the local mechanical promotion of a permanent establishment of stable equilibrium between the forces acting on the teeth, arches, and jaws, and by the elimination of those local and general influences affecting the teeth or jaws, which tend to cause a return of a corrected malocclusion to its original condition.

The first principle to be observed is undoubtedly the establishment of a natural equilibrium between the local forces which act on the teeth, arches, and jaws, so that no one element acts in such an overpowering manner as to make possible, even in a slight degree, a return to the abnormal.

As an example of what is meant by the elimination of general influences, take mouth-breathing. If it is rightly considered one of the prime factors in the causation of contracted dental arches, then the solution of the problem of maintenance of the expanded arch is not only the local mechanical holding of the teeth until the alveolus becomes consolidated; not only the establishment of fully patent nasal passages, but an insistence on the absolute cessation of mouth-breathing. Leave that alone and our unaided mechanical retention is found hopelessly inadequate.

For the sake of effecting a continuity in the study of this subject, the following three cardinal points, as presented by Case in a paper at St. Louis in 1904, on "The Principles and Technique of Retention in Orthodontia" [Cosmos, 1905, xlvii, 649], will be discussed, dealing as little as possible with actual technique, that side of the subject being outside the present reference. These points are:

(1) Influences of inheritance.
(2) Influence of physical relations before and after correction.
(3) Principles of retaining appliances and technique of construction and application.

INFLUENCES OF INHERITANCE.

Without overloading this report with the pros and cons of the possibilities of the inheritance of dental deformities, it should be stated that Case claimed that the tendency to return to the inherited abnormal is so strong as to require permanent retention. He seems to think that all conditions can be inherited, from single malturned incisors to excessive protrusions and retrusions, but only one form of permanent artificial retention, that relating to separated upper centrals, is mentioned, which certainly has not proved an unmixed blessing in the writer's practice.

If treatment be undertaken under such circumstances, in the manner suggested, we certainly have a questionably permanent result with a maximum of danger, for Case himself quotes Kingsley as saying years before, in "Oral Deformities," "The wearing of retaining plates, as well as other fixtures upon the teeth, is undesirable and objectionable. They are an evil, necessary in some cases, but to be avoided as much as possible."

R. Dunn in 1910 says, "Disintegration will occur in some cases regardless of all due vigilance." This fact in his opinion should not, however, be made a reason for abandoning treatment.

It has therefore to be decided actuarially, so to speak, between the chances of life of a denture, where the incidence of caries or periodontal disease is due to malocclusion left untreated, plus other causes, and where the incidence of caries or periodontal disease is due to orthodontic treatment, plus the same other causes, but which in this case diminishes in proportion to the normality of the occlusion obtained. The decision must depend on the extent to which these diseases are allowed to affect the denture in either case.

Martin Dewey in 1909 published a series of papers entitled "Some Principles of Retention in Orthodontia." He maintained at that time that the Angle classification was perfect, and the position of the first molars would always remain the true basis of classification, and belittled the influence of heredity.

If inherited malformations are accepted, however, they are admittedly

rare, and only need to be mentioned before passing to the second and more important division of the subject.

INFLUENCES OF PHYSICAL RELATIONS BEFORE AND AFTER CORRECTION.

In considering retention, Case saw clearly that the influence of physical relations *before* treatment had to be taken into consideration, as well as those present afterward. The one comprises all those etiological factors which affect the teeth and jaws, either normally or abnormally, of which the abnormal must be eliminated. The other deals with all those factors which it is the function of local mechanical retention to overcome. Put in this way, it will be seen that all those causes which have been worked out up to the present time, as well as those which may be discovered in the future, are included, and so a continuity in the study of the subject is made possible.

Case says further that there are many instances of irregularity for which esthetic relations cannot be perfectly obtained without extraction, nor can that which it is possible at times to retain without extraction be retained with the same assurance of permanence, because of the forceful tendencies of crowded buccal teeth to assume their former positions. A malocclusion is quite as capable of fixing and retaining the relative positions of teeth as a normal occlusion when the requisite interdigitation of the cusps has been attained and an equilibrium established.

This is a point of view that has been strenuously upheld by J. F. Colyer, only much more dogmatically.

A more detailed way of stating the influence of physical relations before and after treatment is found in the papers of Martin Dewey, already quoted. He points out that the forces controlling retention may be divided into natural and mechanical (or better, artificial).

The *natural* forces that have to be taken into consideration, those which produce normal occlusion in normal arches and jaws according to race type, are—

(1) Force of incline plane (cusp planes in occlusion and articulation of Pullen).
(2) Harmony in size of arches.
(3) Normal muscular pressure.
(4) Normal interproximal contact.
(5) Normal histological structure.
(6) Normal atmospheric pressure.

To which may be added—

(7) Normal secretion of ductless glands.
(8) Normal physiological period of growth.

The last condition is very much dependent on the previous one, only we do not yet know definitely *what* causes or stimulates the eruption of the teeth or growth of the jaws, so it seems wiser to specify it until a definite pronouncement is forthcoming.

Interproximal contact, however, can only be of slight value, if any, as a controlling force in the adjustment of normal occlusion, for there are many cases (other than specific) of the teeth being too small for the jaws; interproximal contact is absent, but the relationship of the jaws and teeth are otherwise normal. Also, as Sim Wallace has pointed out, the first upper molars should come into normally developed jaws without proximal contact with the second deciduous molars.

All the forces named combine to produce "normal function" of the teeth and adjacent structures.

Obviously the converse of some one of these general headings includes the familiar habits of mouth-breathing, thumb, finger, lip and tongue sucking, etc., which have arrested or diverted bone growth originally, or minimized the developmental response to stimulation.

Pullen shows that the forces which operate to produce malocclusion lie far deeper than the faulty interlocking of cusps, which is only symptomatic of lack of function and maldevelopment.

It is the persistent abnormality of any of these physical relations which makes the permanent maintenance of corrected malocclusions impossible. Their perfect balance after correction

produces that rare condition of unaided natural retention described by Isaac Davenport at the Fifth International Congress, 1909.

As has been pointed out elsewhere, many tooth movements are carried out much more rapidly than bone and muscle can develop to a compensating state, and until such growth takes place natural retention is not to be expected.

The normal action of all these "natural forces," with perhaps the exception of interproximal contact in cases of symmetrical and scientific extraction, are necessary for "permanence of result," and operate with less than "the minimum of danger."

A consideration of "The Artificial Forces Controlling Retention" necessitates the study of "The Influences of Physical Relations After Correction" and "The Principles of Retaining Appliances." Artificial methods of retention occupy the same relation to the finished case that scaffolding does to the completed building; they are necessary to steady the teeth while the resistive qualities of bone and periodontal membrane are overcome, and while awaiting development of bone, muscle, and fibrous tissue.

PRINCIPLES AND TECHNIQUE OF RETAINING APPLIANCES.

Retentive forces are operated from fixed or removable appliances, and as Lischer points out, must be used to promote maintenance of corrected—

(1) Tooth position.
(2) Arch form.
(3) Arch relation.

The dangers of the various appliances used will be discussed first. Bearing in mind Kingsley's dictum as to the undesirability of the use of *any* appliance in the mouth, it is clear that the one that can be discarded quickest is the one to choose.

Extreme difficulty is experienced in pronouncing a strictly judicial opinion on such a controversial subject as fixed *versus* removable appliances, and the same ground will be covered by other reports at further deliberations of this congress. Both systems have their place, and the choice must often be dictated by what will be the most efficient method of "antagonizing the backward tendency of the teeth only" without clamping the teeth so firmly as to discourage normal movement and development, and thereby risking the pathological conditions so often set up by bridge work.

Caries, directly attributable to it, may occur with any appliance.

Some writers claim that the danger of oral sepsis is graver with the use of fixed appliances, while others stoutly maintain that gingivitis, the recognized initial stage of pyorrhea, is more often present when plates are worn.

The opinion of the one school may be summed up as follows: Fixed appliances when properly designed are so constructed as to exhibit the highest degree of efficiency. Any progressive alterations may be easily made at the chair-side, and individual parts abandoned as soon as their action no longer becomes necessary. They are not apt to damage the soft tissues; above all, they are out of the patient's control and must be worn, whereas a removable appliance is likely to be forgotten, or even lost, with accompanying disaster.

Against these arguments may be set the danger of the cement washing out unnoticed from under a band, which can only be met by strict supervision at frequent intervals, a point often neglected when patients are allowed to travel without this difficulty being provided for. There is also the problem of keeping the teeth dry during cementation, a point claimed to be of no importance when hydraulic cements are used, but the perfect adaptation of the two surfaces must thereby be prevented. The strictest oral hygiene is of the greatest importance in any case.

If one had to rely on one method only one could not but choose the fixed appliance as most adaptable in the majority of cases, especially when rotation and buccal-to-lingual movements have

been attempted. On the other hand, where a splint is required to supply the space of missing deciduous teeth for the sake of increased function, or a biting plane is continued after treatment, as suggested by Rogers, Skogsburg, and others, the use of removable appliances, whether those of Jackson's design or not, will prove of value. It seems much more rational to use biting planes of any description before other tooth movement is attempted, otherwise the retentive force of the interlocking cusp planes is lost. Such an appliance is only efficient in direct ratio to the muscular force of the patient.

The "minimum of danger" is obtained only by constant watchfulness, cleansability of the apparatus, and scrupulous cleanliness on the part of the patient. Operate for young patients, attach apparatus to deciduous teeth where possible, thus shortening the time of contact with the permanent teeth. Periodontal tissue, between ages six and twelve, is always changing, and has a better chance to recuperate at that time. It is maintained with reason that very early correction of malocclusion does away with many dangers to the permanent teeth, and the fallacy of "no irregularities" occurring in the deciduous dentition cannot be exposed too often. At the same time it is disappointing to note that there is often aberration in position of the permanent tooth germ, which erupts in malocclusion and necessitates further treatment, but of so slight a character as a general rule as not to involve the permanent teeth in any danger.

LENGTH OF TIME OF APPLICATION OF RETENTIVE FORCE.

The length of time of application of artificial retentive force, together with efficiency of design and simplicity of construction, are the essential points in connection with artificial appliances in order to obtain "permanent results."

Case considers lateral expansion (or root movement) a *sine qua non* to successful retention in some mouths, and it is interesting to note that the so-called working retainer that Angle introduced involves this principle, gentle stimulation producing bone growth and root movement at the same time, thus shortening the period of retention, but the apparatus is not simple in construction, although now used both for tooth movement and retention. Case thinks that a period of rest, such as given by the action of a screw, is preferable to the constant application of force, as by a spring. This method is applicable for cases of lack of development where tooth movement only is contemplated. Reports of results of this type of treatment have not yet been proved by time.

When perversion of development is present, as in class II, division 1 cases, the continued but gradually diminishing use of intermaxillary traction is advocated, the fixed spur and plane having been practically abandoned.

It is curious to remark that in his treatment of class III by resection of the jaw, Angle advocates the principle of extraction of teeth to better harmonize the arches. In these cases we may get a permanent result, but certainly with a maximum of danger.

After the knotty question of fixed or removable retainers has been settled, the greatest puzzle in artificial retention is the time factor. The widest margins are given by different authorities. All agree that the teeth must be held for varying times, from no time at all in "natural retention," four years' retention mentioned by Angle, to permanent retention of inherited malocclusion of Case. Several cases of retarded eruption of the second molars have been recorded in which these teeth did not appear till sixteen years of age, and one has to wait all this time for the necessary vertical development at the back of the jaw.

No data are available to guide us as to how long any particular type of case should be retained. Dewey says six months is long enough for any case properly treated. Herbst in 1909 said six to nine months. Pullen and others are more cautious, and in many cases

consider two years' retention by no means too long.

One must necessarily be guided by the type of patient, age, general rate of development, and muscular power. Cases commenced at eight years should certainly be watched till ten years, or even later, if there is lack of development in the canine region.

The ideal is the thing to strive for, but is seldom attained. What that ideal should be must be left to the individual conscience of the operator and the circumstances of the case.

In the foregoing remarks an endeavor has been made to crystallize the present knowledge of the theory and practice of retention into one short paper, and if the writer has succeeded in but throwing a guiding light on to the pathway leading to that well where Truth lies hidden, he will feel amply rewarded.

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THE ORAL SPECIALIST'S RESPONSIBILITY IN SYSTEMIC INFECTIONS.

By ALEXANDER D. McCONACHIE, D.D.S., M.D., Baltimore, Md.

(Read before the Maryland State Dental Association, at its annual meeting, Baltimore, Md., June 10, 1915.)

MAN, in his evolution, has been slowly proclaiming his rights—those inalienable rights to life and the pursuit of happiness. His path has been beset with many barriers, chiefly his own ignorance, the besetting sin of our race. Slowly, but patiently, through scientific experiment, he has blazed the path to a purer, better, healthier life, and happiness, and the dental profession is surely adding its quota to this advance.

THE AWAKENING TO THE IMPORTANCE OF ORAL HYGIENE.

When I was a student of dentistry, over twenty-seven years ago, the mouth was never thought of as a disease-producing factor, indeed the greatest single source of infection of the body, as it is known today. Emphasis was then placed only upon the necessity of repairing decayed teeth by proper fillings and replacement of lost teeth by proper plates. At that time little of value was known in regard to crown and bridge work. What a change, radical and wholesome, has been wrought! Today the dentist has a wider, broader, more comprehensive view. He is realizing that his sphere in preventing infections and ill health is as great—yes, greater—than that of any other single specialty.

I do not mean to say that the mouth is responsible for all of our ills. There are other avenues of infection—the tonsil, the pharynx, the prostate, adenoid tissue, and many other areas where focal infection takes place.

Dentists have, for the past decade or so, been scolding the public and each other for neglecting proper oral hygiene. The dental profession—a portion of it, at least—has awakened to its responsibility. The public is beginning to take notice. Witness the non-kissing propaganda, individual drinking-cups, pure-food agitations, etc. The physicians and surgeons, some of them, are growing keenly alive to the great need of a clean, sterile mouth as the *sine qua non* in the treatment of many hitherto obscure and incurable conditions. The dentist's work has only begun. The human brain has an infinite capacity for resisting knowledge calculated for its welfare. Probably this is due to the fact that we must know so much that is not true, the facts of today being the fallacies of tomorrow. Witness the recent indictment of the tooth-brush by Dr. Bernard Feldman, and on the other hand the tooth-brush field day in Central Park, N. Y. It would seem we are in great need of getting our facts straight before we can make great progress.

INTESTINAL TOXEMIA.

Let us for a few moments examine the *facts as known.* It is granted as proved that the mouth may contain nearly every form of bacteria known—in all, over one hundred and fifty varieties have been isolated—the mouth being the best ground for their development, especially the lymphatic ring of Waldeyer, including the tonsils, faucial, lingual, and pharyngeal.

The bacteria gain entrance through food and drink, and, after multiplying on the enormous surface of the teeth

and gums, of necessity pass on into the stomach and bowels and frequently alter the whole chemistry of digestion, producing what is known as auto-intoxication, *i.e.* bacterial poisoning. Many of these bacteria may be carried directly through the lymphatics and the blood stream to any and every tissue of the body, especially if lesions exist in the mouth about the teeth and gums.

Let us briefly review the facts of auto-intoxication, intestinal toxemia so called. It is the protein portion of the food that makes for repair and formation of tissue. Digestion splits up protein into a number of simple substances, amino acids, the so-called "building-stones" from which each cell selects what it requires for its own use.

These building-stones act as an excellent medium for the growth of bacteria, and the resulting putrefaction produces toxins of great virulence and power for harm. These may be absorbed from the intestinal canal, circulate in the blood, and give rise not only to symptoms met with in many diseases, but also to structural changes in organs and tissues of the body.

The bacterial content of the intestines is large under any conditions; from one-third to one-half of the ordinary bulk consists of bacteria, pathogenic and non-pathogenic. The malevolent bacteria of the intestines include such as bacillus coli, a mutation form of the endamœba of pyorrhea, bacillus proteus, bacillus welchii, bacillus enteritis, various forms of stapylococci, streptococci, etc., many of which are carried from the mouth and its infected area.

RESULTS OF AUTO-INTOXICATION.

As a result of this hourly insidious poisoning or intoxication, there may be increased arterial pressure, gradual degeneration and sclerosis of the arteries, increased connective tissue formation, and atrophy of parenchymatous tissue, caused by increase of vascular pressure. There may be marked interference with the normal correlation of various internal secretions, pituitary, thyroid, adrenal, etc., and resultant disorders of circulation, elimination, digestion, and of the nervous system. Indeed, the toxicity may express itself as coryza, bronchitis, sciatica, palpitation, gout, neuralgia, arthritis deformans, insomnia, muscular pains (so-called rheumatism), mental hebetude, skin irritations, loss in strength and weight. The cerebro-spinal system may exhibit the most varied symptoms in consequence of this condition; lack of mental control—neurasthenia, being very irritable, excitable, exacting, and miserable—also headache, neuralgia, and neuritis, are common. Indeed, any condition can be aggravated by intestinal toxemia.

The oral hygienist cannot hope completely to remove intestinal toxemia from his patients, but he can aid in lessening the bacterial content by the removal of every source of bacterial growth in the mouth, gastric secretions having been proved to have little influence in destroying bacteria.

Systemic infection by way of the lymphatics and vascular system from infected lesions in the mouth and about the teeth, I consider to be definitely proved. Anatomic and physical factors render the ingress of bacteria easy, thereby facilitating their distribution throughout the system and setting up acute and chronic processes in various parts of the body, *e.g.* nasal accessory sinuses, salivary glands and ducts, bronchi, gall-bladder and ducts, pancreas, appendix, uterus and tubes, kidney, bladder, prostate, and seminal vesicles—if not directly, then indirectly, by way of the tonsils.

THE ENDAMŒBA BUCCALIS.

Smith and Barrett of Philadelphia have recently shown that the protozoan, endamœba buccalis, which holds an important relation to the etiology of pyorrhea alveolaris, or Riggs' disease, may find its way into the tonsils and maintain inflammatory changes therein, with associated systemic complications. Whether or not we accept the endamœba as the specific cause of the disease, we

know from clinical evidence that its removal, with associated bacteria, no matter by what means—emetin, a so-called "specific," antiseptics, or surgery—produces almost magical results, both locally and systemically.

APPENDICITIS AS A HEMATOGENOUS INFECTION.

Just here, let us take note of some recent work by Dr. C. Rosenow, of the Memorial Institute for Infectious Diseases, in Chicago, on "The Bacteriology of Appendicitis and Its Production by Intravenous Injection of Streptococci and Colon Bacilli." To quote from the *Journal of the American Medical Association:*

Rosenow's experiments indicate that in the absence of foreign bodies, appendicitis commonly is a hematogenous infection, secondary to some distant focus like the tonsil (*and possibly the teeth*). [Italics mine.] The striking feature is the demonstration that the disease develops when for some reason the organisms in this focus, usually streptococci, have acquired an elective affinity for the appendix, and at the same time gain entrance into the circulation. In animal injections, the tonsillar strains of micro-organisms from human cases produced appendicitis in nineteen out of twenty-nine, the appendix strains in twenty-two out of thirty—a total of forty one out of fifty-nine trials. In further accord with the view advanced is the observation that after cultivaton on artificial media for a short time, the elective affinity is soon lost, and strains isolated from human tonsils some time after appendectomy also appear without elective affinity. The colon bacillus is to be regarded in most cases as a secondary invader, because it is found, both by culture and in sections, either in decreasing numbers from the lumen outward, or is displaced entirely by streptococci. Experimentally it appears to be almost impossible to produce appendicitis by intravenous injection of colon bacilli without injuring the mucous membrane.

These important newer researches help to explain the stated frequent occurrence of appendicitis at times almost in epidemic form, when throat infections are particularly prevalent. They emphasize the importance of a thorough search for and the removal of foci of infection (*particularly that largest focus, about the teeth*) [italics mine] from which appendicitis may originate in the indirect way pointed out. If the conclusions prove correct it is a distinctive contribution on the part of Rosenow, that a focus of infection is to be looked upon not only as the place of entrance of bacteria, but also as a place where they may acquire the varying affinities necessary to infect distant organs and tissues.

Finally, whether we accept the contention of Bass and Johns that Riggs' disease, the most frequent mouth lesion, is caused by the endamœba buccalis, or believe it to be a mixed infection with endamœbæ present, we must know that the amœbæ feed largely upon the accompanying micro-organisms, and thus by their phagocytic action set free different endotoxins. Bacterial toxins thus originating vary in their effects after absorption, producing hemolysis, cellular degeneration or necrosis of tissues, or inflammatory changes in synovial or serous membranes.

CONCLUSIONS.

Enough is now definitely known and proved to emphasize the following conclusions:

(1) That the mouth is the largest portal through which infectious micro-organisms may enter the body.

(2) That every physician and surgeon, in looking for causative factors, should in every instance include a careful inspection of the mouth as a routine part of his examination.

(3) That the oral specialist must realize his work for humanity to be larger than the mere filling or replacing of teeth. He must look beyond the diseased mouth to the physical condition of the patient in order that he may determine whether the oral condition has produced disease elsewhere, and, if necessary, ask the aid of a physician or surgeon.

(4) That the public should be taught that all diseased and unclean mouths should be made healthy and clean; that this should be done regardless of the loss of teeth; that life, health, and happiness are more important than teeth. Our slogan should be, "Clean your mouth and save your life."

CONTROL OF CHILDREN AND THE MANAGEMENT OF CHILDREN'S TEETH.

By HAIDEE WEEKS LATHAM, D.D.S., New Orleans, La.

"POETS are born, not made." Likewise the God-given gift of tact in the handling of children comes to some and is denied to others. Tact is the touchstone which admits one to the sacred precincts of the child's heart and gives one his confidence and obedience.

Failing of tact, we can do much by careful study of the child mind to bridge over the chasm which lies between ourselves and these chosen ones; but the innermost court of the temple will never be reached.

REASONS FOR NEGLECT OF CHILDREN'S MOUTHS.

The child's mouth is more often neglected than given proper care. Were it not for the protection that pain brings, the neglect would be still greater. The reason for this neglect is twofold. Ignorance on the part of the parent or guardian is responsible for some part: disinclination or inability on the part of the operator to face the peculiar conditions incident to childhood is the basic factor in a large number of cases.

GAINING CHILDREN'S CONFIDENCE.

In every art there are rules which have been worked out by experience. The genius, the master mind, rises above these rules, but ordinary mortals must work by them and gather a little here and a little there.

When Johnnie comes first with a toothache and leaves in comfort and peace, the way is paved for future relations with Johnnie. However, if when Johnnie is first examined he is free from pain, and a considerable amount of more or less painful work is needed, it is seldom wise to proceed at once to work. Better let him ponder for a day or two on a pleasant experience, and he will come back with more courage to endure the pain incident to the needed work. Absolute truthfulness is essential to any sort of successful relationship. Deceive him once, and his confidence is gone forever.

Highly strung and neurotic children usually have highly strung and neurotic parents who have systematically erred in the handling of their children. One nervous person in an operating room is quite all that is desirable at one time. It is a safe rule to invariably exclude the parents from the operating room.

If a little patient comes with a painful tooth, an exposure demanding an extraction, the operation must be done, cost what it may. Children bear a shock of this kind well and recover promptly. Be firm, be quick. The child appreciates success even more fully than the adult. Prompt success with a child is of the utmost importance in controlling him in the future. Failure forfeits his friendship. The operation should be planned beforehand and carried out so that, when the child leaves the chair, he will know that some permanent service has been done.

The tissues of the teeth of the child differ in no material way from those of the adult. They are quite hard enough and quite strong enough to withstand the same operations and to carry the same fillings as the adult's tissues. It is a question of the individual—the difference between an immature person with undeveloped power of reasoning and self-control and a mature one in

whom these powers are supposedly developed.

The pathology and therapeutics of the diseases common to the mouth of a child may be presented under three heads:

(1) Diseases incident to the process of teething.

(2) Diseases of the deciduous teeth and the soft tissues before the eruption of the permanent teeth.

(3) Diseases of the permanent teeth during childhood.

DISEASES INCIDENT TO DENTITION.

Dentition may be defined as the physiological process by which the child is supplied with teeth. It begins with the formation of the tooth germ at about the middle of the second month of fetal life and ends with the establishment of the permanent third molars in the arch.

The early calcifying tooth is in a crypt within the alveolar borders and surrounded by vascular tissue which separates it from the bone of the jaw. The alveolus is formed by the thin layer of bone covering the crypt. Over the crypt the bone is fissured to facilitate the passage of the tooth crown, and the root formation begins, and continues until three to five years after the crown has assumed its position in the mouth. While this is going on, the tooth socket or alveolar wall is gradually forming.

While the eruption of the teeth is a physiological process, it is nearly always associated with disturbances of function which are pathological. The process by which the tissues are forced out of the way is one of absorption under pressure. The cusps of the teeth act as the irritant which produces the stimulus to the absorption, in consequence of which the tissues are tender and painful. A hyperemic condition can be noted at a glance besides the other phenomena accompanying inflammation. The parts become hot and a desire is manifested to bite cold things in order to relieve pressure irritation. This is nature's provision for forcing the gum tissue away. The infant may aid nature by the use of an ivory or silver ring.

Faulty nutrition, undue density of the overlying tissues, or other complicating circumstances may interfere with the process of dentition, and we may occasionally encounter complications which even endanger the life of an infant.

Indications of teething. The indications of teething are an increased flow of saliva due to an irritation of a branch of the fifth nerve which supplies the salivary glands, nature's method of irrigating and cooling the inflamed area. Mucous cheek eruptions are prevalent which are reflex in origin, causing the child to be wakeful and restless. If several delayed teeth are erupting at the same time, and the consequent conditions severe, we may have colic and convulsions in a highly nervous child. Miller found the bacteria which causes infant diarrhea in the mouth at this time.

In examining the mouth of an infant, we should look at the region where, according to age, the tooth should erupt; second, we should examine for lesions of the mucous membrane; and third, for abnormal frenum.

Severe local inflammation. In severe localized inflammation, the lancet should be used under aseptic precautions to relieve the pain. In examinations of children's mouths we frequently see small vesicles about 2 millimeters in diameter surrounded by a reddened zone. These soon rupture, forming ulcers with grayish bases and bright-red margins. The ulcers are sunk into the tissues, and the slightly indurated margins stand up above the surrounding areas. They most frequently occur on the margins of the tongue, and the inner surface of the lip and cheek. These conditions are usually associated with attacks of nervous indigestion. Children often refuse to feed on account of the pain.

Treatment of ulcers and thrush. We should touch the ulcers with a saturated solution of nitrate of silver and use an antiseptic mouth-wash. The patient should be referred to a physician for further diagnosis if the local conditions are persistent. Thrush, or parasitic stomatitis, is seen in very young children on the mucous membrane, caused by the

oïdium albicans, belonging to the yeast family and presenting branching filaments and spores. It rapidly develops in unclean mouths, especially when catarrhal conditions of the mucous membranes are present and acid fermentation of food remnants is permitted to occur. This attacks the tongue first, then rapidly spreads to all mucous surfaces and appears as slightly raised, pearly white spots which gradually enlarge and coalesce.

The mouth should be kept scrupulously clean, and an alkaline wash should be used to relieve the burning sensation. A little lime-water in the milk will often correct the acid mucous secretions and do away with the pain. The general health should be taken care of by the physician, as it will be found that the child's nutrition is poor, presenting some marked disturbance in digestion.

Treatment of abnormal frenum of tongue and upper lip. An abnormal frenum of the tongue may cause fretting and difficulty in nursing, not allowing the infant to use the tongue in swallowing. The frenum should be removed by clipping from the under surface of the tongue and from the floor of the mouth, holding the tongue with a pair of forceps.

The technique of correcting an abnormal frenum of the upper lip is different. On the labial surface the ligament is cut at an angle to the periosteum and down on each side to a position one-third beyond the attachment to the hard palate, and removed. The approximating surfaces on the labial aspect are sutured with horse-hair. After a week the sutures are removed. It is necessary that this ligament be removed, as it is one of the causes of malocclusion as well as of pyorrhea in later years.

DISEASES OF DECIDUOUS TEETH AND SOFT TISSUES OF THE MOUTH.

The child should be brought to the dentist the second year, as the care of the temporary teeth has prime importance for facial contour and the value of the permanent teeth in relation to their formation and position in the arches. By bringing the child early, no painful operations are necessary, as a rule, and the dread of the dental chair is not instilled in him. As he grows older he can be taught prophylactic measures which will materially aid him in the care of his teeth.

The deciduous teeth must be cared for to perform the functions of mastication, and retained until the time of the eruption of the permanent set. The spaces must be retained so that the development of the arches will not be retarded by the loss of the deciduous teeth, and malocclusion of the permanent set result. We rarely find malocclusion in deciduous dentures, owing to the simple and normal habits of the child. The cusps interdigitate on eruption and maintain an important relation to the development of the bones of the head and face. This interdigitation of the cusps becomes lessened as they become flat from wear, permitting freedom in the relationship of the jaws to each other, which in many cases is due to the lack of normal locking of the permanent first molar.

Faulty eruption. The deciduous teeth are not only necessary for the child for the triturating and masticating of food until replaced by the permanent set, but they are necessary in the development of the alveolar process and the jaw. If the mesio-distal relationship is not impaired by caries, the permanent first molar erupts posterior to the deciduous second molar and the ramus on the lower jaw and the maxillary tuberosity in the upper jaw. If, however, we lose the deciduous first molar on one side of the lower jaw, the permanent first molar will push the deciduous second molar mesially to occupy a portion of the space vacated by the deciduous first molar. Thus this lateral half of the dental arch will be shortened, and, with the normal lengthening of the upper jaw, malocclusion will result. There being no space retained for the bicuspid, it will be deflected buccally or lingually. The lower arch will not develop, causing a protrusion of the upper incisors or an irregular arrangement of them in the arch.

The beginning of calcification of the deciduous central incisor occurs about the seventeenth week of fetal life; the tooth erupts when the child is six months old. The twenty deciduous teeth are in position about the thirtieth month. There are many deviations from the normal. The roots begin to be absorbed, commencing with the central incisor, at about the fourth year. Absorption is the physiological action of the osteoclasts for the removal of the roots of the temporary teeth.

The rule that the central incisor begins its absorption at four, the lateral at five, the canine at nine, the first molar at seven, will not hold in many cases, but we can make an almost positive diagnosis with the X-ray; so why run the risk of losing a tooth through an improper diagnosis, when it may be confirmed in a few minutes by one of the most important aids in our work?

Faulty absorption. Under aseptic precautions we may fill the root-canals of the temporary teeth as we do those of the permanent set. Absorption begins and will proceed at the proper time as with vital teeth. The root-fillings, not being absorbed, will remain in the tissues without producing any irritation.

Pathological conditions at the apex of the root will arrest the process of absorption. The rhachitic and the anemic child will not have perfect absorption. Anything which interferes to a greater or less degree with metabolism will arrest absorption. Permanent teeth are deflected in their eruption by lack of absorption of the temporary roots. The bicuspid is often held back by lack of absorption of the roots of the temporary molar. This will not happen if the X-ray is used to determine at the time of eruption the cause of delay.

An abscess at the root of a deciduous molar often occurs before the enamel of the crown of the bicuspid is formed, and either interferes with the function of the enamel organ or destroys it, and the bicuspid exhibits symptoms of atrophy.

There may be absorption of a deciduous tooth without a permanent tooth to take its place. This occurs occasionally in the lateral incisor. In cases of delay, or lack, or any other anomaly of eruption, we should determine the cause by the X-ray.

Hyperemia and its treatment. Deciduous teeth are subject to all diseases common to the permanent set, but in a modified form. Hyperemia results from the same causes, but does not produce as severe pain in the adult. Absorption has by this time opened the root-canals, and the lymphatic circulation is improved.

The treatment must always be palliative. The carious cavity should be cleansed as quickly and with as little instrumentation as possible, using a spoon-shaped excavator that will almost fill the cavity, for removing the débris pressing on the pulpal wall. The cavity must be dried out, and a pellet of cotton saturated with "1, 2, 3" placed on the pulpal wall, and the cavity filled with gutta-percha.

Treatment of putrescent and abscessed teeth. In putrescent and abscessed teeth we mechanically cleanse the canals, place a dry dressing of "1, 2, 3" and leave it for two weeks, when, if no inconvenience is felt, the roots may be filled. For deciduous teeth the same technique in root-filling is followed as in permanent teeth. The rubber dam is placed when it can be used, gutta-percha points, 3 millimeters in length, are placed in the canals, which have been cleansed and wiped with eucalyptol; then chloropercha is pumped into the canals until no air-bubbles are seen in the pulp chamber. The tooth cavity may then be filled with amalgam.

Treatment of carious deciduous teeth. In caries of deciduous teeth we take the individual into consideration, choosing the most thorough procedure which the child will permit us to carry out. In interproximal caries of the anterior teeth, the incisal angle is removed with a sharp chisel, and all carious dentin scooped out with the largest spoon excavator suitable for the cavity, and a broad open space made which will be easily kept clean by the excursion of food and the fluids of the mouth. The

dentin should be given an application of silver nitrate and exposed immediately to the action of bright daylight. In a few minutes there will be found upon the exposed dentin a reduction of the silver nitrate and a brown discoloration. The dentinal tubules will be occluded, and caries arrested. We may often use gutta-percha in the anterior teeth. In occlusal caries it is best to use amalgam, as this material prevents the wear of the teeth and aids in maintaining the bite until the eruption of the first molar. Amalgam is better than cement in deciduous teeth, as the acid in the latter is very irritating to the dentinal fibrils.

Tubercle bacilli have been found repeatedly in the scrapings from carious cavities in children otherwise free from clinical evidences of tuberculosis. These findings may account for a considerable number of infections occurring in childhood or adolescence, and render imperative the treatment of caries in the child's mouth. Many other pathogenic organisms have also been found in caries.

TIME OF ERUPTION OF PERMANENT TEETH.

My own observations in Louisiana have shown that the average age for the eruption of the permanent teeth is from eight to twelve months earlier than that observed in a colder climate. If the deciduous central incisor has not been exfoliated at the age of seven, an X-ray examination should be made of the root of the deciduous tooth and the position of the permanent one. This will nearly always show that the deciduous tooth should be extracted.

The temporary molars are often retained owing to lack of absorption. If by the tenth year they are still in position, radiographic examination should be made.

DISEASES OF THE PERMANENT TEETH.

The eruption of the permanent teeth is the same as the absorption of the deciduous teeth, and each permanent tooth is formed from a bud of a deciduous tooth, except the first permanent molar, which has its bud thrown off posterior to the enamel organ of the temporary teeth about the seventeenth week, and at the ninth month the follicle is complete, and calcification is begun. The second molar is derived from the outer tunic of the first, and the third molar from that of the second. The roots of the teeth are not complete until from three to five years after eruption. There are as many variations in the eruption of the permanent as in the absorption of the deciduous teeth. These variations cause difficulties in diagnosis. In the proper use of the X-ray, however, we have a method of overcoming these difficulties in nearly all cases. It is hazardous indeed to undertake the devitalization of the pulps of the permanent teeth in the mouth of a child unless one has a radiograph disclosing the conditions of the roots.

We often see imperfections in the enamel and dentin of the centrals, laterals, canines, and first molars due to lack of nutrition during the period of the formation of these teeth.

Treatment of the permanent first molar. The most important tooth with which we have to deal is the first molar. It conceals its arrival by erupting posterior to the deciduous teeth without any inconvenience to the child. It is not heralded by the exfoliation of any of the deciduous teeth. The first molar is not thought to be a permanent tooth by the laity, and is therefore the more neglected and liable to become carious. No tooth is so often lost from inattention during the time of its development, and no tooth is more easily conserved by proper attention correctly timed. When this tooth is lost early by caries there is a distortion of the face resulting in malocclusion, a lack of contact of the permanent teeth, which is one of the causes of gingivitis resulting in pyorrhea. Caries in the first molar generally occurs first in the mandible in the central and buccal pits, and these cavities should be filled permanently as soon as found, carrying the extension to sharp grooves

where we may obtain good finishing points. In occlusal caries involving a great deal of dentin, the excavation should be made in two sittings to avoid a nervous shock to the child, and a hyperemia which may result.

A temporary filling of gutta-percha is inserted, and the patient is dismissed for six weeks, when the cavity may be properly excavated and permanently filled.

Pulp exposure and its treatment. Should the pulp be exposed accidentally by a sharp instrument, a capping of gutta-percha should be applied. The field must be aseptic, the rubber dam in place, the walls of the cavity cleansed and wiped with eucalyptol, a gutta-percha disk held in readiness to fit the pulpal wall of the cavity, warmed to body temperature and depressed slightly in the center of the surface to be placed next the pulp, with no space for air or transudate from the pulp. A drop of chloro-percha is placed occlusally of the disk and tapped in place. The affinity of eucalyptol for gutta-percha holds it in contact with the cavity walls. The remainder of the cavity may be filled with gutta-percha. An X-ray should be taken at once and kept on record. At the end of six months, if no inconvenience is felt in the meantime and the X-ray shows the pulp to be vital, a permanent filling may replace the gutta-percha filling. The irritating action of the zinc oxyphosphate, oxychlorid, and oxysulfate cements on the sensitive dentin prevents their use.

A pulp exposed by caries before the completion of the roots should be extracted at once to prevent any further trouble or alveolar abscess.

Treatment of incisors. Lingual pits in incisors are to be found about the eighth year, and should be filled permanently with gold. Approximal cavities in the incisors may be found at this time also, but on account of the age of the child these are difficult to manage, as "extension for prevention" must be used, and the teeth are about one-third covered with gum tissue at this time. Great care must be exercised in excavating, as the pulps are very much larger than in the adult, and the danger of exposure is greater.

The open apical ends of roots are a menace in all operations during childhood. The pulps of the lateral incisor are larger and more liable to exposure than any other tooth. In consequence, difficult root-fillings occur earlier than with any other tooth, likewise frequent mishaps.

CONCLUSION.

In conclusion I would say that pathological conditions found in the child's mouth show no essential differences from those found in the mouth of the adult. The indications for treatment are the same.

The limitations upon the carrying-out of these indications are due to a lack of self-control on the part of our little patient. This forces a compromise. The degree of yielding on our part to effect this compromise depends upon the relationship established with the child. This relationship must be simple. We must study to put ourselves in the child's place, and if possible view the situation with his eyes. Success with children stands on a foundation of firmness, gentleness, dexterity, and truth.

RAREFYING OSTEITIS, PYORRHEA, OR WHAT?

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AN apology, if one is due, is offered by the writer for adding still another article upon this vexed question; but he feels that there is not enough unanimity among the profession as to the disease itself, and it is time that some consolidation of thought be arrived at.

NOMENCLATURE.

Dr. Joseph Head, for instance, says that 20 per cent. of the cases of pyorrhea do not present pus. This statement, while wrong literally, would be correct were the profession to decide upon a suitable name for the disease. Others assert that pyorrhea is the name given to that condition where pus is present in the pockets and around the necks of teeth; no other condition is called pyorrhea, and without the pus around the teeth we cannot have pyorrhea. The 20 per cent. of cases mentioned by Dr. Head are not pyorrhea, but the initial stages of the disease leading to pyorrhea.

It is a pity that the British and American dental associations, with the International Dental Federation, do not unite upon some common name by which we may call the disease, and so put an end to the various names employed by the many authors upon this subject.

CLINICAL SYMPTOMS.

Absorption of alveolus and deposition of tartar. The first clinical symptom apparent to the dentist in this disease is the loss of the alveolus. This may occur around one tooth or many. This atrophic condition is usually accompanied by deposition of tartar, which may precede the atrophy of bone, and should be taken as a warning sign that the disease is in progress. This deposition, it is suggested, is nature's effort to compensate for the loss of bone. Suffice it to say that in many cases where the tartar has not been removed, it usually forms a very efficient splint for loose teeth, and removal of the deposit causes a greater flexibility of the teeth in their sockets.

What relation the loss of bone tissue and tartar bear to one another has not been clearly defined, but should afford interesting investigation.

Recession of gum. Following the atrophy of the bone we have loss of support for the gum tissue; under the force of mastication it breaks down, causing recession of the gum, which is the second stage. There is no recession of the gum until there has been previous absorption of bone, since in no case of recession of the gum is bone exposed—a natural sequence if recession preceded absorption.

Septic or pyorrhetic stage. Once the dental ligament is destroyed, pockets are formed, and in these decomposing food and oral germs accumulate. This in the majority of cases terminates in the formation of pus, and the entry upon the third stage of the disease, *i.e.* pyorrhea alveolaris. It is for this reason that the writer suggests that the solution of this enigma is not to be found in the cure of pyorrhea, but rather in finding the cause of the original loss of bone tissue.

TYPICAL PYORRHETIC TEETH.

It is of interest to note also that this disease has a "type" of tooth all its own; a type so distinct that the accustomed eye can discern that the mouth which

harbors such teeth presents rarefying osteitis, or its sequela, pyorrhea.

The teeth are usually strong, hard, brittle, and devoid of caries. They have an excellent luster and a tendency to transparency. These teeth are perhaps more marked in the later stages of the disease.

EXTRACTION NOT A CURE.

The unfortunate phase of this disease is that absorption prevails even after extraction. This is evident in any mouth having a history of pyorrhea. Plates after five years do not fit. The depth of the alveolus of the denture is markedly deeper than the alveolus remaining.

The older the denture, the more marked the difference, and occasionally one finds folds of unabsorbed gum which lies in the floor of the mouth in excess of the remaining alveolus. Extraction may cure the septic condition, but it does not cure the original disease.

OPENING OF POCKETS PREFERABLE TO VACCINE THERAPY.

As regards a solution for the cure of this disease, it is not my intention to do more than offer suggestions, with which investigators may or may not agree. But they may be helpful from an argumentative standpoint.

The main suggestion is that the disease should be stopped before it reaches its third stage, the stage of pyorrhea. The cure for pyorrhea may be found, but that means a cure for the last stage of the disease only. For this reason it is suggested that for the average man in the street who cannot afford vaccine treatment, the pockets of the teeth should be opened up and thoroughly cleansed.

While in the ultimate healing there is a great loss of tissue due to contraction, one realizes that the pockets are bounded by bone, and the breadth and depth of a pocket defines the loss of alveolus. The contracted tissue in an aseptic condition is preferable to a series of pockets, which must be more or less septic, or liable to sepsis. If the pockets are opened up, healing is more rapid, and can be accomplished with ordinary antiseptics; also the diseased portion of the root can be more readily scaled and cleaned.

No matter how healthy one renders the pockets, the gum does not adhere to the root again, and whatever degree of repair vaccine therapists may claim, without the support of underlying alveolus the gum is always liable to break down under the stress of mastication.

POSSIBLE CAUSES.

The cure of the first stage, *i.e.* absorption of the alveolus, will naturally depend upon the cause of irritation.

Civilization. Civilization may be the cause of the loosening and loss of the teeth, since the food we eat does not require much mastication, and just as other useless organs have atrophied, so nature may be preparing to discard teeth not greatly used. Just as man has lost his fourth molar and is gradually losing the third, so this affection may be attributed to the same cause.

Heredity. Heredity certainly plays a great part in this disease, and in families where one or both parents present the disease, it is practically certain that the children will at some time develop it. It is these inherited cases that will tend to nullify Dr. Reed's and his *confrères'* efforts in their investigations with regard to the relationship of syphilis and pyorrhea.*

Carrying the argument farther, it would be interesting to know if the disease is infectious? Its occurrence is certainly on the increase.

The majority of cases have a rheumatic history, or gouty tendency, and since a cure for these diseases is as doubtful as a cure for rarefying osteitis, there is no reason why the medical and dental professions should not unite forces in a more diligent search for the ultimate solution of this vexing problem.

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* "The Interdependence of Pyorrhea Alveolaris and Syphilis." By Dr. G. H. Reed, DENTAL COSMOS, June 1915, p. 628.

THE TREATMENT OF A "CLASS II, DIVISION 1" CASE INDUCED BY ANKYLOSIS OF THE JAW.

By H. E. KELSEY, D.D.S., Baltimore, Md.

(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, at its sixth annual meeting, New York City, May 20, 1915.)

HISTORY.

IN presenting the results of treatment of this case, I have thought best to leave the matter of history largely to Dr. Baer, who previous to my work operated on the ankylosed joints, and who has consented to give a description of his operation in this and similar cases. I may say, however, that the condition in this case began at a very early age, almost in infancy, and that the patient during the first year had pneumonia and whooping-cough and an abscess on the right side of the neck just below the angle of the jaw, for which a head bandage was worn three or four months, the abscess having been open during that period and lanced three times in the region of the angle of the jaw. The patient, between the first and third years of age, also had scarlet fever and typhoid. The most significant phase of the history to an orthodontist, however, is the almost constant fixation of the jaw by the bandage for so long a time during a pathological disturbance situated close to the temporo-mandibular joint. It is also worth noting in this connection that the patient was fed by the bottle for the first eighteen months, owing to the mother having had pneumonia.

CLINICAL PICTURE.

The patient was brought to me by Dr. Baer to determine whether, in my opinion, the malocclusion and subnormal development of the lower jaw could be improved by orthodontic treatment in case he was successful in his operation for the ankylosed joints. At this time the patient presented the following conditions: The lower jaw was completely locked by bony ankylosis on both sides, and was so short and undeveloped as to give the most unfortunate appearance to the face, suggesting to the layman mental degeneracy, and subjecting the patient to uncomfortable observation. The teeth, so far as could be observed through the small aperture between the upper and lower jaws, presented advanced caries of all stages, from cavities with exposed pulps to mere remnants of roots, some of which were abscessed. The upper jaw was narrow, and the anterior teeth protruded, the lower lip resting beneath them as in other class II cases, only very much more pronouncedly. Speech was indistinct, and articulation, of course, very difficult owing to entire lack of movement of the lower jaw and want of space for the tongue.

The patient's general health, while not robust, was better than might have been expected, considering that he fed himself entirely through the space between the protruded upper and retruded lower arches. He seemed to have acquired the ability to macerate soft food with the tongue against the roof of the mouth, but swallowed meat only in as finely comminuted a condition as could be obtained with knife and fork. The patient's height was normal, though he was rather slender and light. He was of a genial and pleasant disposition, and in spite of such a handicap was both popular and successful in school. It was evident, however, that nature's tolerance had nearly reached its limit, and that the pa-

tient's health, happiness, and mental vigor must soon have succumbed to the increasing abnormal conditions, the inaccessible abscessing teeth alone being sufficient to set up serious constitutional disorders.

SECURING MODELS.

I was, of course, desirous of securing a model of the jaws and also photographs, before treatment of any kind was commenced, and the obtaining of an impression presented a problem that had to be overcome in a different manner from that adopted in cases in which the mouth can be opened. I succeeded fairly well, however, by pressing impression material around the outside of the arches under the lips and cheeks, in much the same manner as study impressions are made in ordinary cases. Fig. 1 shows right and left profile and full-face views of the patient at this time. Fig. 2 shows a model of the arches before operation on the joints.

STAGES OF OPERATION.

After going over the history of the case and learning that the condition had existed since infancy, my opinion was that one could not say definitely whether such a case would respond to orthodontic treatment like similar cases produced by other causes, but I saw no reason why the case should not respond to such treatment. Dr. Baer then operated successfully on the left side, but with only a slight result so far as ability to open the mouth was concerned. I was, however, enabled with much difficulty to insert two thin aluminum plates between the upper and lower dental arches, between which I had the patient stretch a rubber band of such a thickness that, when the ends were released, its contraction had a strong tendency to press the plates apart, and with them, of course, the jaws. This caused considerable pain, particularly on the right side, which had not been operated on, and in the teeth themselves, and in about two or three months had only the effect of opening the jaws slightly more than one-eighth of an inch, this being due to the muscles of the left side springing the jaw down, and not to any movement of the joint on the right side. As this treatment was only experimental and proved unsuccessful, I so informed Dr. Baer, who decided to operate on the right side. The result of this operation was completely and immediately successful. (See Figs. 6 and 7.) I saw the patient in my office about two weeks afterward, and, somewhat to my surprise, he was moving his jaw in speech in quite a normal manner. At this time he also had a sufficiently strong bite to masticate all ordinary food and was doing so as well as his carious teeth would permit, without any special pain. I saw him again in five or six weeks, and was able at that time to take plaster impressions as shown in Figs. 3 and 4. The jaw was so short that the posterior portion still did not open very wide, and I had some difficulty in removing the tray, it being necessary to cut it in halves before I could do so. This, however, was not a serious obstacle.

I have referred to this case as one of class II, division 1, induced by ankylosis of the jaw, because I believed this to be the cause, though the patient was a mouth-breather to some extent, which habit, however, has been largely discontinued since treatment was commenced —owing, no doubt, to the greater ease in closing the lips. The chief object of treatment was to stimulate growth in the lower jaw, besides widening and reducing the protrusion of the upper jaw.

The treatment was actually commenced in January 1912, and up to that time there had been no change in the relation of the upper and lower arches, as was shown by the occlusion of the teeth, and it is my belief that there would have been very little improvement without orthodontic treatment, notwithstanding the regained function of the jaw; for while this would have in the future produced growth equal to the growth in other bones, it would not have stimulated the much greater development that was necessary for the jaw to approximately catch up in development

with the adjacent structures. Indeed, as we all know, malocclusions once acquired are maintained notwithstanding the use of the jaw in mastication, by forces that operate quite as effectively as those which maintain normal occlusion.

To accustom the patient to appliances and find out if the case would behave under treatment in a manner similar to others, I applied expansion arches with ligatures and intermaxillary elastics. The response was immediate and most gratifying. (See Fig. 5.)

After a year the new Angle appliance was placed upon the lower arch to secure better anchorage, to better control the occlusal height of the anterior teeth, and to carry the roots of the anterior teeth forward, their angle of inclination being nearly or quite forty-five degrees. The response to this new appliance was most gratifying, and I was able to accomplish what I believe could not have been done by any other adaptation of the expansion arch. Of many cases in which I have had satisfactory bone development following the use of this appliance, this was by far the most striking, and together with the constant use of the intermaxillary elastics and the natural exercise of the jaw through its regained function, not only the alveolar process but the body of the jaw itself

FIG. 1.

Front and profile views of patient before treatment.

FIG. 2.

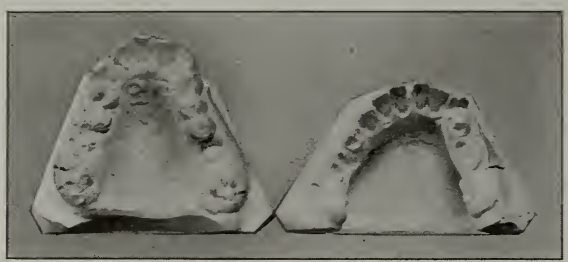
Model of arches before operation on the joints.

showed much growth, as can be noted by the increased distance between the first bicuspid and the second molar on the left side and the increased interproximal spaces between the teeth on the right side. (See Figs. 10 and 11.)

It can be observed that the upper and lower second molars are in about the same relation to each other as they were before the treatment, but while the first lower bicuspid was distal to the upper second bicuspid originally, it is now an-

Fig. 3.

Fig. 4.



Figs. 3 and 4: Models made from plaster impressions taken about six weeks after operation on the joints.

Fig. 5.

Views taken after one year of orthodontic treatment.

terior or mesial to the first bicuspid, representing a movement of nearly

Fig. 6.

Fig. 7.

Figs. 6 and 7: Showing the extent to which the patient could open his mouth about one year after operation for ankylosis.

Fig. 8.

Appearance two years after orthodontic treatment was commenced.

Fig. 9.

Three years after orthodontic treatment was commenced.

three-quarters of an inch, while the lower canines and incisors were all carried forward bodily. The lower second bicuspid on both sides was congenitally absent, and the space between the second molar and first bicuspid was only suffi-

cient to contain what was left of the roots of the first molar. These roots, as well as the first molar on the opposite side, were abscessed, but were treated by Dr. Grieves with such success that they have given no subsequent trouble. They are still in the jaw, and on the left side the two roots are occupying only a fraction of the space gained, which will be filled by a bridge carrying two teeth, a first molar and a second bicuspid, as soon as the appliances are removed; this will probably be done this summer, the teeth for a year past having been practically in normal occlusion, as indicated by the canine and bicuspid teeth.

Of course, there has been a certain amount of retraction of the upper arch, but a careful comparison of the relationship of the second molars in the original models (see Fig. 2) with that observed in the most recently made models (see Figs. 10 and 11) shows that by far the larger part of the change consists in the growth and development of the lower jaw, the protrusion of the upper jaw being chiefly reduced by widening and retraction of the anterior portion.

Although there is a prospect of a considerable further development, it cannot be expected that the jaw will ever attain to the full size which nature intended, though it might have done so had the surgical and orthodontic work been started at six or seven instead of fourteen years of age. So far, however, as the relation of the teeth is concerned, the case is nearly normal, and with bridge work which will supply missing teeth and retain others in their present position, the patient will be equipped for a successful and happy life. Indeed, it may not be out of place to mention that, notwithstanding his trips from another city to Baltimore for treatment, he has during the last year made such a high average in school as to be excused from examinations.

In comparing Figs. 8 and 9, it is necessary to call attention to the fact that

Fig. 10.

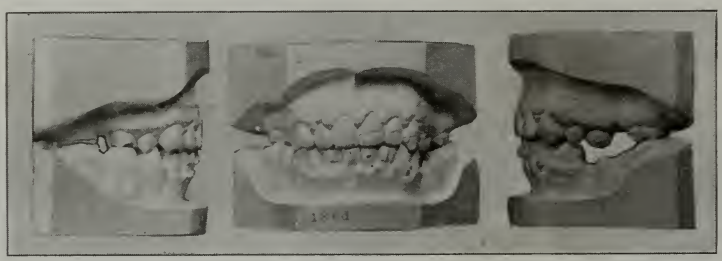
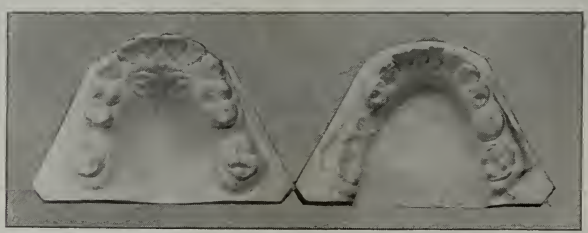


Fig. 11.



Figs. 10 and 11: Showing development of lower jaw and occlusal relation of arches after three years of orthodontic treatment.

in the interval between the taking of the two pictures the patient was hit by a baseball on the bridge of the nose, this having had the effect of considerably accentuating its already somewhat Roman character, and slightly diminishing the effect of our efforts toward correcting his profile.

The treatment has been gratifying in many respects, but in none more so than in demonstrating again that a steady pull upon a bone will stimulate its growth and development, at least when operating toward the normal.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

CORRESPONDENCE.

DENTISTRY AND THE WAR.

The Dental Corps a Recognized Unit in European Armies.

To the Editor of the Dental Cosmos:

Sir,—To one who has devoted much time and energy in the development and establishment of the dental corps in the United States Army, the following clipping, from a New York newspaper, is very gratifying:

Canadians at Plymouth.

Dental Corps Arrives with a Fresh Body of Troops.

Ottawa, July 4.—The steamer "Mitsanabie," with the 29th Battalion, one company each of the 38th and 47th Battalions, and a Canadian dental corps, arrived in Plymouth yesterday, according to a statement issued by the Militia department tonight.

The great need for the services of such a corps was recognized shortly after the opening of the great conflict in Europe, and the excellent work done by individuals in the military hospitals of England, France, and Germany emphasized the necessity for the organization of the dental corps as a part of the military equipment of all the warring nations.

The above clipping, to my mind, is a most gratifying admission of the importance of our profession in the attainment of a proficient fighting force. This should encourage our legislators to make suitable provision for increasing the efficiency of our present dental corps.

William C. Fisher, *Pres.*,
Association Military Dental Surgeons.
New York, N. Y.

Treatment of Gunshot Fractures in German Field Hospitals.

The following interesting letter has come to hand from Prof. Dr. Guido Fischer, dean of the Dental Department of the University of Marburg, which we reprint in part:

Oral Surgical Department,
Station for Gunshot Fractures of Jaws,
War Hosp. 123, IVth Army,
Belgium, September 2, 1915.

. . . As you may have heard, I had the good fortune to go to the front on special mission. I was commissioned to aid in organizing the entire dental care of our armies in the East and West, and, in consideration of my specialty, received additional orders to establish a station for gunshot fractures of the jaws in the IVth Army. I have been appointed surgeon of this station, and I may say that our organization is exemplary. We have installed 30 beds and 20 cots in a beautiful chapel of the monastery in which our entire war hospital is housed. The monastery can hold over one thousand wounded. Since

Copyright International News Service.

German army dentists giving free treatment to the inhabitants of a captured Polish town.

Photo by International News Service.

The French soldier "patient" shown has already been mentioned in dispatches for exceptional bravery, but he had to be held down by two orderlies while a decayed molar was being removed.

October 1914 it has been altered into a modern hospital; thus we have two halls for surgical operations, one for septic, the other for aseptic wounds, a large Roentgen room, a pathological laboratory for making sections, departments for internal medicine, infectious diseases, eye and mouth lesions, and a special department for gunshot fractures of the jaws. With the last, a technical laboratory is connected, so that I can construct all kinds of splints just as in time of peace. Oral surgery and the treatment of oral lesions, of course, demand most of my time, and local anesthesia has rendered and will in the future render most beneficent aid in allaying the untold sufferings and pains of our usually serious cases.

As a testimony of the approval of the work of this station, the chief of the Field Sanitation Service made an inspection, and had subsequently conveyed to me the specific expression of the government's fullest appreciation of this work.

In my station, over thirty sanitation officers of the active army, mostly surgeons, have received instruction in the treatment of fractures of the jaws, and the lectures given in this course I have published in book form under the title "First Dental Aid in the Field: A Guide for Physicians, 1915. With over 60 partly colored plates. (H. Meusser, Berlin.)" As you may see, we are cheerfully working ahead, and the blessings of all this activity in all branches of the healing art will benefit enemy as well as friend. Many a Frenchman's, Englishman's, Canadian's, and Belgian's mutilated face I have helped to restore to dignified human appearance, without earning thanks for the individual service, but to my own proud satisfaction over having been privileged to help them all.

My services, of course, entail great sacrifices, as I have lost all my income from my practice and the university. The salary paid here is very small.

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Proceedings of Societies.

EASTERN ALUMNI ASSOCIATION OF GRADUATES OF THE ANGLE SCHOOL OF ORTHODONTIA.

Annual Meeting, held in New York City, May 20, 21, and 22, 1915.

The annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia was called to order at 10.30 o'clock on Thursday morning, May 20th, in the Hotel Vanderbilt, New York City, by the president, Dr. A. W. Crosby, New Haven, Conn.

The vice-president, Dr. H. A. Kelsey, Baltimore, took the chair while the president, Dr. A. W. Crosby, read his annual address.

Dr. Crosby announced as the next order of business a lantern lecture by Dr. F. L. Stanton, New York, on "An Instrument to Survey and Map the Positions of Teeth."

Dr. Stanton showed the original model of an instrument devised by him for surveying and mapping the proper positions of the teeth in the arch, based upon data from measurements made of skulls at the National Museum in Washington, and the Museum of Natural History in New York. In demonstrating the use of the instrument, Dr. Stanton surveyed a number of models of cases of malocclusion. The instrument is provided with facilities for reading the elevations of the teeth in tenths of a millimeter. Dr. Stanton's demonstration was accompanied by numerous lantern slides showing the surveys of various models of cases.

The meeting then adjourned until the afternoon session at 2 o'clock.

Thursday—*Afternoon Session.*

The meeting was called to order on Thursday afternoon at 2 o'clock, by the president, Dr. Crosby.

Dr. Crosby announced as the first item on the program for the afternoon session the reading of a paper by Dr. Lawrence W. Baker, Boston, Mass., entitled "Methods and Results of Teaching Orthodontia at the Harvard Dental School."

The next item on the program as announced by the President was the reading of a paper by Dr. H. E. Kelsey, Baltimore, entitled "The Treatment of a 'Class II, Division 1' Case Induced by Ankylosis of the Jaw."

[This paper is printed in full at page 1263 of the present issue of the Dental Cosmos.]

Discussion.

Dr. H. C. Ferris, New York. Were any X-rays taken? I think it would be interesting to see X-rays made of this patient's jaws at the present time.

Dr. Kelsey. Yes, X-rays were made of the case.

Dr. A. L. Johnson. Did you put the patient on any exercise for chewing?

Dr. Kelsey. Yes, I had him chew gum, and he chewed so constantly that he had to get a sort of special dispensation from the school teacher.

Dr. Stanton. I think the society is very fortunate in having this case presented under its auspices. It will probably prove a most remarkable demonstration to physicians and laymen as to the possibilities of orthodontic treatment. Of course, being a "man of one idea," I necessarily go back to the idea of measurements. I feel that the essayist has been misled as to some of the changes

that have occurred. [To Dr. Kelsey:] Have you any photographs of the case with you?

Dr. Kelsey. None but the lantern slides shown.

Dr. Stanton. Between now and Saturday I would like to survey this patient's profile and show where the changes have occurred. A study of the models of this case would probably show that there has not been a great forward development of the chin. The eye is deceived in the changing of these lines, and I think a survey will show where the growth has taken place.

Dr. Kelsey. I may say that we made a sort of cardboard silhouette of the patient's face—that is, a piece of cardboard was cut so that it would rest on the forehead, the point of the nose, and the point of the chin. This cardboard was placed against the face some time ago, and when resting on the forehead and the chin was found to be about a quarter of an inch off from the point of the nose. This would indicate that something had moved, and I think it is conclusive proof that the jaw has lengthened. I may also add that the accident referred to caused the nose to be very much more prominent, and I think this would make the change in the chin less apparent; I think the jaw has been lengthened at least a half-inch, if not more.

Dr. J. Lowe Young, New York. I wish to compliment Dr. Kelsey on the results obtained in this case; and I think he deserves a great deal of credit for undertaking to treat such a case. This should prove a stimulus to each one of us, when one such unfortunate being presents, not to be afraid to do the best we can for him. Dr. Kelsey has been able to accomplish a marvelous result in a comparatively short time. It would be interesting to see from X-rays of this case what condition developed in the temporo-maxillary articulation. Just recently I had X-rays made of a patient, twenty-one years of age, that show clearly the condition of the condyle on each side. It proves, without doubt, that the condyle on the left side has been moved, or that there is an asymmetrical condition of the two condyles. When this patient came to me he had five lower incisors. I do not know whether he had five deciduous incisors or not, but I presume that he probably had. The X-rays which were taken with the mouth open and closed belong to the few pictures of that region I have ever seen which really showed anything very clearly. Most radiographs are misleading, and do not prove anything. Dr. Kelsey's report is very encouraging to me, because it proves that even apparently hopeless problems can be solved successfully.

Dr. Kelsey (closing the discussion). I have nothing to add to my paper. Attempting to be brief, I did not include in the paper any of the details of treatment. Of course there were many minor details to overcome, such as we meet with in every case. The general treatment was similar in a general way to that employed in every class II, division 1, case. An argument might be raised, of course, as to whether this case really was one of class II, division 1. With regard to Dr. Young's remarks, I wish to say that this was not the most difficult case I ever tried to treat, for the reason that the patient was with me from start to finish and helped to obtain a result which it would have been impossible to obtain with some patients—a pleasant task. He has been willing at all times to lend himself to the work, not only in the treatment, but also by his willingness to present himself before the members of this society, and I have to thank him very much for whatever success we have secured.

Motion was then made and carried to adjourn until Friday morning.

Friday—*Morning Session.*

The meeting was called to order on Friday morning, May 21st, by the president, Dr. Crosby.

The first item on the program for the morning session was the reading of a paper by Dr. J. A. C. Hoggan, Richmond, Va., entitled "Art and Orthodontia." This paper, which was accom-

panied by an exhibition of paintings done by Dr. Hoggan, here follows:

Art and Orthodontia.

By Dr. J. A. Cameron Hoggan,
Richmond, Va.

The particular nature of the raving in which the public indulges over dental triumphs is not of the character which builds monuments for us. This is not the fault of the public alone, but the weakness of our self-government. The profession of law has wrapt about it the glamor of eloquence and sudden startling tricks of thought. Medicine rests its full weight upon the responsibility of life and death, and theology upon the hereafter. But dentistry!—is it to take its humble seat at the footstool of medicine, or rise to a plane of its own? Dentistry means art—art in the way the world has read its meaning, the production and reproduction of things beautiful; and this achievement must be the future task of dentistry and orthodontia.

Man's ability to accomplish any task, or to master any obstacle, is dependent upon the exercise of his various senses. In the study of art he forms the habit of trying to memorize visual impressions. He forms a mental picture, and is constantly trying to reproduce these pictures. If the probability of success in undertaking to obtain a definite object in orthodontia is dependent upon one's ability to form a mental picture of a rational plan, the analysis and practice of art, in my opinion, affords excellent training for the orthodontist.

If we can, by determination and persistent effort, improve ourselves, we are undoubtedly raising the status of our profession. If there is any real enjoyment in the beautiful things of this world, this gratifying feeling is greatly intensified by the consciousness of having made things beautiful ourselves. If we make art our dominating factor in this world, it molds our whole philosophy of life. What we are, the things we do, our very existence, become the poetry of life, not merely an act of living. This attitude must not be confused with the efforts of a race for supremacy; it is but the calm, patient, persistent effort toward doing things right.

In the Hall of Fame we already have the art of Norman Kingsley, J. Wilson Peale's portrait of George Washington, the work of Karl Ahrnes, the painter of trees, and there are probably others with whom I am not acquainted. It remains for some dentist to apply art on a big scale to dentistry; this is the only way of lifting it out of the crafts. There is no technical operation in dentistry any more disagreeable than is painting in oils or modeling in clay. Among a thousand dentists, I maintain, more good artists will be found than in the same number of men engaged in any other line of endeavor. The placing of dentistry on the plane of art in the right way can only be accomplished by an effort that is selfless—a universally unselfish principle, not an idea loaded up with the weight of a man's personality. The trained hands, the average eye, and the cheerful, determined industry with which the true orthodontist fashions order and harmony out of chaos, is the combination of the same abilities as are necessary for the production of good pictures in oil, or models in clay. The first essential in the reproduction by the individual of any part of nature, or any object, is a practical mind, a mind that will naturally analyze problems, and just as naturally be contented only with a satisfactory solution. There are also practical minds which easily command the hands to execute their conception of a solution. Genius in different directions is frequent, the masters are rare, but according to Mendel's law, the normal individual absolutely devoid of any one talent must be as rare as are the masters.

You say to yourself, "I can conceive of a plan in a general way, or I can imagine a result, but cannot possibly supply the detail necessary to build a house, a normal arch, or write a play." I claim emphatically that, if you can propose a rational plan, or frame in your mind a picture, or dream, of a

normal arch, the detail of execution is simply a matter of training; the result is the degree of industry and determination applied to mastering the detail. At this moment I am convinced that some of you are quite determined that you could not under any circumstances paint a picture—that such a task requires a natural ability which you do not possess. This is the easiest and the most common exit from the field of art, but you must not forget that it is also the refuge of the clod.

When art is mentioned, one first thinks vaguely of Michelangelo—or Harrison Fisher—and then uncertainly, step by step, depending upon our education, we come down to orthodontia, and we console ourselves that we are a little bit of an artist in our way. What we should think is that our pictures are probably good, as pictures go, that some day they are going to be better, and when they are the best that it is possible for us to make, they are not quite on a level with our orthodontia, and a perfect face.

Horace Grigg, in his "Philosophy of Art," groups poetry, music, painting, and sculpture as art. I cannot possibly separate the skill necessary to produce normal occlusion from the reproduction of the human body in clay or marble. Going farther, efficient training in orthodontia should include an extended course in modeling and sculpturing, a practical application of the thought that Dr. Angle and Professor Wuerper stirred in us at school. Frequently the claim is made that the result of an effort in painting by an individual so mechanical as the dentist, results in a picture flat in tone or even lacking in harmony of color. I admit that there is no doubt of such a result accruing from the efforts of some men; the fact stands recorded, but I maintain that it is not the mechanical tendency which is the cause of such an effect, but the lack of development of the faculty of harmony, or sense of color, below the average.

The great obstacle to be overcome in the matter of creating facial harmony by orthodontia is a realization of the fact that such an effort is just as much a matter of training as drawing, or the making of Angle's new appliance. It is a matter of study, and not a gift from God alone.

The decorative is the biggest factor in art. Color enters very materially into any scheme of decorating, but the power of imagination, the value of form, and the sense of harmony that is essential to beautiful decoration, are absolutely impossible to attain without great industry.

To place ourselves in the right attitude in relation to art, we must dispel the idea that art is a plaything, a hobby, or a domain separate from our serious business. Art should be useful; if it is not, it fails. A picture may in itself be beautiful, but if it mars the harmony of a room for which it was intended, it fails. We all love good pictures, and good pictures of our own make are the best kind of good pictures. Why should we not make them? And if we do not study art for art's sake, we should study it for orthodontia's sake.

Discussion.

Dr. H. E. Kelsey, Baltimore, Md. If I repeated all the discussion I have had with Dr. Hoggan on this subject, it would constitute a large part of the proceedings of this society. The essayist has never answered my inquiries and objections so completely as he has today, not only in his paper, but by the pictures he has presented. He is evidently possessed of talent that he is quite unaware of, and I think he has been a little too modest in ascribing to all of us talents which he himself possesses, and also an industry that few of us have. There is a great deal of truth in his contentions, and it would probably be good for every orthodontist to have some hobby in which to interest himself.

Dr. Milo Hellman, New York. I am sure that I for one could not produce anything like Dr. Hoggan has produced here. His exhibition was a surprise to me. I am not criticizing what he says from the standpoint of the painter, but I

know something about art in general, and I maintain that, in order to bring about such results as he has shown, one must in the first place possess natural talent, and secondly, must exercise extreme perseverance. I have seen a great many artists with talent, who lacked the perseverance to bring out their talent, and I have seen others with less talent but with more perseverance who produced wonderful results. A combination of talent and perseverance will naturally bring about the best results. I must congratulate Dr. Hoggan on possessing the rare talents required and the extreme perseverance demanded in order to accomplish such beautiful pieces of art.

Dr. J. G. Lane, Philadelphia. Perhaps Dr. Hoggan forgets, in his interest in art, that it is a side issue and should be considered as a hobby. Before he began reading his paper I told him that everybody needed a hobby. I was a little surprised, therefore, when I heard the paper—in which he disclaimed his art studies to be a hobby. Elbert Hubbard made the statement that the man who does not get pleasure out of his business will never have pleasure. That is all very well so far as it goes; but I believe a man needs a hobby, and will derive as much pleasure from it as he can ever derive from his business. It is evident that Dr. Hoggan's and my own ideas of a hobby are not the same. I believe that every man should have a hobby to take his mind off his arduous work for at least a part of the time; and if he does not work the hobby too seriously he is likely to get some fun and a lot of benefit out of it. When I was looking at the pictures I asked Dr. Hoggan several times if he had painted them. He assured me that he had, and when he was reading his paper I did not know whether we had a Roosevelt or a Michelangelo in our midst—and he might easily be both.

Dr. B. W. Weinberger, New York. The thought occurs to me in looking over these pictures, that in the field of orthodontia we have had two men, the foremost leaders of early times, Dr. Kingsley and Dr. Farrar, who were recognized as artists. I think such work as the bust of Christ by Dr. Kingsley, exhibited in the library of the University of Pennsylvania, and the carvings of Dr. Farrar, will probably leave a lasting impression upon the minds of those within and without the profession; these men will more often be remembered by their art than by the great work which they accomplished in orthodontia. I agree with Dr. Hoggan that these side issues—although he did not designate them as such—leave impressions on the minds of individuals. No doubt, art has been as great an incentive to Dr. Hoggan in his professional work as it was to both of these pioneers in orthodontia.

Dr. F. T. Murlless, Jr., Hartford, Conn. It is a pleasure to express my appreciation of Dr. Hoggan's work, because I feel that he has established the fact that there are many outlets for our activities which we have not thoroughly appreciated. I suppose all are familiar with the idea that self-expression is really a duty, and an art which should be cultivated, and I am reminded of Story's words that "All arts are one, all branches upon one tree—all fingers, as it were, upon one hand."

Dr. Hoggan (closing the discussion). I merely wish to say that I cannot help but feel that, in the examination of any case of orthodontia, in the study of any part of nature, we are but using our brains, we are but exercising good common sense; we are dependent upon visual impression. It is not likely that optical illusion has occurred to Dr. Kelsey more frequently than to me. I have not taken any instruction in this work, and I did not know that I could do it until I tried. I read this paper in the hope that some of you would carry out this thought, and try if you cannot do what almost every artist has done. I cannot possibly see any difference between my love of nature and anyone else's, because I have no natural ability above the average, and I can prove that in many ways satisfactory at least to myself.

In regard to art being a hobby, I

would say that naturally we make a hobby of things we love. But when a hobby comes so closely into contact with the practice of one's profession as does art to ours, then we can surely call it by some other name than hobby. I may say that all of these pictures are reproductions of other pictures, enlarged or otherwise changed in size.

Gentlemen, if I have in any way stimulated your aspirations in regard to art and to carrying it out in a practical way, I have accomplished my object.

(To be continued.)

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA.

Fifty-second Annual Meeting, held at Wilkes-Barre, Pa., May 18, 19, and 20, 1915.

THE fifty-second annual meeting of the Susquehanna Dental Association of Pennsylvania was called to order Tuesday morning, May 18th, at 10 o'clock, in Irem Temple, Wilkes-Barre, Pa., by the president, Dr. T. W. Thomas, Wilkes-Barre.

Rev. LOUIS LINDENSTRUTH, Wilkes-Barre, invoked the divine blessing on the deliberations of the association.

An address of welcome to the society was made by Hon. W. E. WOODRUFF, and responded to by Dr. W. C. SHIPMAN, Shickshinny, Pa.

The vice-president, Dr. Donnegan, then took the chair, while the president, Dr. T. W. THOMAS, read his annual address.

Dr. Donnegan appointed as the committee to consider the Address of the President, Drs. Kingsley, Coult, and Bordner.

The next order of business was the reading of the minutes of the previous meeting, by the secretary, Dr. Knox.

Motion was made and carried that the minutes be adopted as read.

Dr. DONNEGAN moved that the DENTAL COSMOS be made the official organ of the society for this meeting. (Motion carried.)

Motion was then made and carried to adjourn until the afternoon session.

TUESDAY—*Afternoon Session.*

The afternoon session was called to order by the president, Dr. Thomas, at 2 P.M.

The secretary, Dr. Knox, read the resignation of Dr. C. E. Grim, Reading, Pa. Motion was made and carried that the resignation be accepted.

The first item on the program for the afternoon session was the reading of a paper by Dr. C. S. VAN HORN, Bloomsburg, Pa., entitled "Buckley's Paste as a Desensitizing Agent."

[This paper is printed in full at page 1236 of the present issue of the DENTAL COSMOS.]

Discussion.

Dr. W. A. SPENCER, Carbondale, Pa. Having used this remedy only a short time, I do not feel in a position to discuss it in the manner it deserves. I presume that all those present know as much of this preparation as I do. I have been using the desensitizing paste in selected cases for probably three months, and during that period have not been able to discover any bad results in reference to irritation of the pulp; its use has thus far been very satisfactory to me. I have not used it indiscriminately, selecting only cases in which I diagnosed the pulp to be in a healthy condition. My guide for judging of the

healthy condition of a pulp is usually the sensitivity of the dentin. We frequently find teeth which have been troublesome, yet in which the normal sensitivity of the dentin under the bur or excavator indicates a healthy condition of the pulp. If hard dentin when being excavated does not respond, we may reasonably expect that the pulp is not in a healthy condition. In the teeth of elderly persons, however, this rule would not hold.

I have a record of the teeth in which this paste has been used, and have had an opportunity to examine a number of them some weeks after the operation had been completed, and in no case have I seen any indication of bad results. In one of the first cases, I used this paste in three teeth for the preparation of cavities, two cervical and one approximal, and this morning I called this patient in to finish up some work. I had forgotten how long these teeth had been prepared, and when I looked up the record I found that the paste had been applied in one of the cavities on the 3d of March, and had remained there until this morning. This cavity, in a lateral incisor, in which the paste was still present, was quite large, and the patient reported no trouble with the tooth except slight uneasiness at first. I had applied the paste to the other teeth previously to that date, and the patient complained of a little aching between the time of application and that of filling—which is usually done two days afterward; I do not know of any other case where I have allowed the paste to remain longer than two days. On examination of the approximal cavity in the lateral incisor, I found the dentin rather sensitive, but there seemed to have been a change in the condition of the carious dentin. The paste, as it contains formaldehyd, may have a tendency to arrest decay and possibly may tend to prevent recurrent decay in cavities in which it is used. The change in the character of the decay was so marked that I noted it particularly. I find that in the application of this preparation to cervical cavities it has to be sealed in thoroughly with cement in order to prevent the remedy from coming in contact with the gums and causing sloughing. I believe with the able essayist that we should keep accurate clinical records of our cases, and compare results; for if this remedy should affect the pulp it would mean a lot of future trouble. "Safety first" is a good motto for us to follow in dealing with hypersensitive dentin. I feel that we are hardly on perfectly safe ground with such a remedy until we have watched it carefully for a considerable period of time. Next year I hope the reports of results will be as satisfactory as they are at the present time.

When we promise painless dentistry to our patients, we may apply Buckley's paste to cervical cavities and excavate them painlessly, but we should bear in mind that the application of the rubber dam in these cases is not altogether painless, for, as in the case to which I refer, the pain of excavating was nothing in comparison to that occasioned by my effort to keep the rubber dam out of the cervical cavities, and Buckley's paste does not help us much in that respect. The difficulty of thoroughly opening up a cavity painlessly, and the necessity of seeing patients within twenty-four hours after application, adds somewhat to the difficulty of using this paste; with our regular patients, however, we can arrange appointments so as to overcome this drawback.

I think the profession should appreciate the manner in which Dr. Buckley has presented this remedy, and I trust that this paper will provoke a discussion that will be of benefit to all of us.

Dr. W. C. Middaugh, Easton. Dr. Van Horn has treated this subject with his characteristic thoroughness, and I agree with him in the main. There are some points, however, in which he and I have always differed, and I suppose this paper will develop some more differences in our opinions.

I have used this remedy for some time, keeping careful records of several cases, and while I am thoroughly pleased with the results in most cases, my suspicions and Dr. Buckley's cautions have

been justified in several instances. If the remedy is used too close to the pulp, the results will not be very satisfactory. Dr. Van Horn in one paragraph of his paper says that formaldehyd is a violent irritant to normal tissue, therefore the use of the remedy should be attended with great caution. Dr. Buckley himself cautions against applying the paste in deep-seated cavities in close proximity to the pulp. The irritation of the dental pulp is probably due to the remarkable coagulating properties of the paste for albumin; the depth to which this coagulation of albumin will go has at the present time not been determined.

I wish to report a case of death of the pulp due to the application of this paste. I destroyed a pulp as effectively in forty-eight hours with this paste as I have ever done with arsenous oxid. This case, I know, was not due to any particular pathological condition of the pulp, because the pulp was normally sensitive. There was an extensive cavity, however, in the distal surface of a bicuspid which extended to the buccal surface, though the tooth had never given any trouble. I determined that the pulp was in a normal condition, in much the same manner as outlined by Dr. Spencer, viz. the dentin was normally sensitive to traumatic influences and responded to heat and cold. The cavity being extensive, I endeavored to cover the whole surface of dentin with the preparation. I dried the surfaces of the tooth beyond the margins, and applied the paste to all the exposed parts, after removing the softest portion of dentin, without exposing the pulp. Then, with cement mixed soft and thin so as to avoid pressure, I sealed the paste in effectively and left it for forty-eight hours. The patient on returning reported that the tooth had been uncomfortable for six or eight hours after application of the remedy. Removing the cement with a bur without causing pain, I advanced as deeply into the cavity as I thought permissible, and then tested with heat and cold, without finding any response. I next tried to see how far I could go, and entered the pulp chamber and removed the pulp without any trouble; there was no sensitiveness at all forty-eight hours after the preparation had been applied, though there had been no exposure of the pulp.

Dr. Van Horn contends that the removal of pulps "under aseptic conditions, in cases with a clearly doubtful prognosis, is to be considered preferable to waiting until the pulp dies and becomes septic." Those are not the cases in which one would ordinarily apply devitalizing paste.

The essayist says that the desensitizing paste "must be sealed in the cavity. Any of the plastics, preferably one of the temporary cements or temporary stopping may be used for that purpose. The writer prefers, where possible, to use either Gilbert's or Fell's temporary stopping; both become very plastic at low heat, and they are easily and quickly molded into the cavity without undue pressure." In most cases where it is necessary to make the application, I find that even a moderate amount of force will squeeze out the paste over the margins. Dr. Van Horn goes on to say that the temporary stopping is effective when it becomes necessary to push away the gum tissue at the cervical margins of cavities. He must be an expert manipulator of temporary stopping if he can do this, as I have never been able to put enough force on temporary stopping to push away gum tissue without squeezing out a soft material of the consistence of this paste.

Dr. Van Horn further says of this material: "After a few hours its chemical action seems to cease, but the desensitizing effect lasts for several days." I should like him to state how he determines that the chemical action of the paste ceases after a couple of hours. I have not gone into this subject quite so thoroughly as he, but it seems to me that it would be very difficult to determine the fact that the chemical action ceases after a couple of hours. He says, further, that "That action of the paste is confined to the tooth area upon which it is placed, and it has no numbing effect upon the pulp." Here I differ with him. I want to ask why, in a large number

of cases, after applying this paste the response to thermal changes ceases in the pulp for a time. If it does not affect the pulp at all, why should the pulp become numb to thermal changes. I have noticed in several instances, after the paste is applied, that the pulp is not normally sensitive to heat and cold; why is this, if the remedy does not affect the pulp at all? The toothache caused by the paste in some instances is very marked, and while some claim this to be of small significance, we cannot be sure of that in the present state of our knowledge of this preparation.

I agree with the essayist that "The important problem we have to solve at this time is: Has the paste any deleterious action upon the dental pulp? and if so, under what conditions? And that cannot be solved by any hit-or-miss procedure of practice, either in the application of the remedy or the records of the cases in which it is used." We all know the effect of arsenous oxid on the dental pulp; it was first applied to desensitize sensitive dentin, and it was some time before we knew that the pulp was destroyed by it. I contend that, while we should give everything a trial, this remedy should be applied with considerable caution, in the light of our limited experience with it.

Dr. Hermann Prinz, Philadelphia. [Dr. Prinz' discussion of this paper is embodied in a paper published in the August 1915 issue of the Dental Cosmos, at page 790, entitled "The Therapeutic Action of Buckley's Desensitizing Paste."]

Dr. H. M. Beck. My method of using Buckley's paste is somewhat different from Dr. Van Horn's. Any food particles that may be in the cavity are removed, but all the débris of decay is left. A small quantity of the desensitizing paste is applied at the point indicated, and over this I flow a little sticky-wax. The wax will hold the paste in position for forty-eight hours, which time will generally be found sufficient to desensitize any cavity. To the best of my knowledge and belief I have destroyed no pulps with Buckley's paste, while I have been able with patients having very sensitive teeth to do work in certain parts of the mouth where no other anesthetic has proved satisfactory.

Dr. Van Horn (closing the discussion). The first paragraph in the paper stated very distinctly and very clearly that its main object was to get a line on the results that are recorded up to the present time by the men who have been using this paste. Every mode of procedure has to go through the probationary period, and as most of us are back here in the woods, we have to come to the front to get light on the subjects that come under our notice. Formaldehyd, no doubt, is to a greater or less extent an unknown quantity when sealed into a tooth cavity, and the object of this paper is to bring out discussion so that we poor souls may get a line on its action.

Dr. Spencer asks whether or not the paste will sterilize. Undoubtedly it will. He also speaks of some difficulty in sealing the paste in cervical cavities. I would suggest that he see the clinic by Dr. Jennings tomorrow, as he has a very unique method of sealing the paste in those cavities.

Dr. Middaugh seems opposed to the use of temporary stopping, and says that he cannot conceive how it can be used to press the gum tissue away without causing pressure in the interior of the cavity. That is a very simple proposition. It is very easy to place temporary stopping, if properly manipulated, in the cavity with as little pressure as would be used with cement; furthermore, if you want to force the gum tissue away, use a surplus of stopping material, and after it hardens soften the surplus with a heated instrument and press it against the gum tissue.

I would remind Dr. Middaugh that I did not say that the paste would not affect the pulp, and I am surprised he should infer that I did, inasmuch as I said emphatically that the important consideration we had to solve at this time is, Does it have any deleterious action upon the pulp? and if so, under what conditions? The last paragraph in the

paper also says that the important consideration is, Does it have any deleterious action upon the pulp?

Now, the answer to that question cannot be arrived at either by academic discussion or by presuming. Whether or not it will kill the pulp I cannot say, but in my six months' use of the preparation I have not experienced the death of a pulp. I will modify that statement a little: I have had the death of a pulp in the tooth of a patient on whom I had used the paste, but I did not use the paste in the tooth in which the pulp died. It was a tooth in which I expected the pulp to die. I had used the paste in other cavities. The patient withstood the pain of preparation of that cavity and I filled it with gutta-percha; the pulp died, and I am treating it now. But the teeth in which I used the paste are alive, to the best of my knowledge—at least they give no evidence of being dead. I trust you grasp the full significance of that statement.

I wish it distinctly understood that I am neither championing nor defending Buckley's paste, but with the evidence we have at the present time I do not believe it is well for us to discard it absolutely. It seems to me, even in view of what Dr. Prinz has said, that the paste may have a place in our armamentarium.

It may surprise you somewhat when I tell you that I am responsible for Dr. Prinz' being on the program to discuss the paper. I happened incidentally to find out that he made the remark that Buckley's paste would kill every pulp in the teeth in which it was used. So when Dr. Bull asked me whom I would like to discuss the paper, I told him I would like Dr. Prinz to discuss it—as much for my own benefit as for yours.

We should weigh what Dr. Prinz has said very carefully, yet I do not at all think it absolutely conclusive, because I have used the paste in cases of sensitiveness, the patient has returned and I have excavated and filled the cavity without causing pain, and subsequently experienced sensitiveness in another cavity in the same tooth. Only yesterday I excavated and filled a cavity in which the paste had been used about two or three weeks ago. It was in for twenty-four or forty-eight hours, when I excavated practically all the carious dentin painlessly, and thought I had the cavity prepared for filling, other than trimming the margins, which is always the last thing done to a cavity. Yesterday—some three weeks after the paste had been used—I found that the cavity was not in the shape I wanted it, and in attempting to prepare it more thoroughly I found the dentin quite sensitive. What that implies I do not know, but it does seem to me to contradict in part at least Dr. Prinz' assumption; for if the bulbous portion of the pulp is killed, as he attempts to show by the methylene-blue test, why are the pulps responsive to the cutting of dentin in these and adjacent cavities in which the paste has been used several weeks previously? Methylene blue, we are told, penetrates dead tissue only; dead tissue cannot transmit sensation save tactilely, and we are not cutting—in these several instances which have come under my observation—upon the pulp, but upon the dentin, which is sensitive in each case in which I have experimented.

I am not in position, nor have I the knowledge or the equipment, to investigate the paste in a scientific manner, but it seems to me that we have in it a remedy that is worth more consideration. I am inclined to disagree with Dr. Prinz' assumption that the quantity of paste used and the manner of application has no relative influence upon its ultimate effect upon the pulp. If we were to assume the same attitude toward ether, chloroform, cocain, morphin, etc., might not the results of their use be somewhat disastrous? We are reminded that many patients have been permanently "devitalized" by a disregard to diagnosis or to improper administration, or both, in the use of ether, chloroform, cocain, morphin, etc. We also know that the quantity of paste used and the manner of application, in reasonably deep-seated cavities, has something to do with whether the tooth is going to ache for

any length of time, and we believe that ultimate pulp devitalization is more or less directly dependent upon the manner in which the paste is applied, the quantity used, and a correct diagnosis. I trust that future experiments will give us intelligible data respecting the condition of the dentin and the pulp prior to the application of the paste to the *sensitive areas,* together with an approximate idea of the quantity used and the manner of its application. While not in the least dogmatic respecting the action of this paste upon the dental pulp, one is inclined to the impression that Dr. Prinz' experiments are too superficial and his assumptions too hasty to be conclusive, or even convincing.

Dr. Beck makes the remark that he uses the paste differently, in that he does not remove the decay. If Dr. Beck inferred from the paper that I remove the decay entirely before applying the paste, I would like to correct that error —because as a rule the removal of the decay is a sensitive proposition. The remark was made that in deep-seated cavities it is sometimes possible to remove the decay immediately over the pulp. These are but a few isolated cases; they are not those that commonly come under our observation, which are always sensitive to the removal of the decay.

I want to take this opportunity for thanking the discussers, and I want especially to thank Dr. Prinz for his discussion, as I believe it will have the effect of putting all on their guard; but I hope it will not eliminate the careful use of the paste—not because it has been apparently satisfactory in my practice, but rather for the reason that it seemingly has a place in the experimental dentistry of today.

Dr. Middaugh. Dr. Van Horn has made one remark in his closing discussion to which I wish to take exception. I ask him why, if the effect of the paste on the pulp is not noticeable, he makes this statement: "It is to be noted that the action of the paste is confined to the tooth area upon which it is placed, and that it has no numbing effect upon the pulp." And again in closing: "We feel that Dr. Buckley has rendered a service to humanity which the dental profession should not soon forget. . . . Therefore we owe him both our moral and financial support."

Dr. Van Horn. I did say in the paper that the paste had no numbing effect upon the pulp, basing my assumption upon the fact that in all cases where I have used the paste for desensitizing purposes, and made the test, if drilling were carried beyond a certain zone the dentin was sensitive. Furthermore, if the paste be applied in the manner indicated in the paper, in a mesial cavity, and the same tooth has a cavity in the distal or any other surface in which the paste has not been applied, that other cavity will be as sensitive as before the paste was applied in the mesial cavity. That is my reason for assuming that the paste has no numbing effect upon the pulp; but I would remind Dr. Middaugh that my use of the paste is confined to its application for the purpose of desensitization rather than to substantiate any preconceived idea respecting the action of trioxymethylene upon the dental pulp; therefore it is applied in cases of hypersensitiveness only, and the minimum quantity is placed directly upon the sensitive area.

As to giving Dr. Buckley our moral and financial support, one feels that we owe him both, for the reason that his remedy apparently has merit, and anything which seems to contribute to the comfort of the patient or to the longevity of the masticatory organs should, in my judgment, receive every support, to the extent even of our time and our money. To illustrate: Dr. Prinz advocates the use of trioxymethylene—the main ingredient in Buckley's paste—in his "An Improved Paraffin Compound" for filling root-canals. Personally, I can see no excuse for the use of trioxymethylene in a paraffin compound, improved or otherwise. Furthermore, if what Dr. Prinz tells us respecting the action of trioxymethylene upon the pulp be true, one seems to foresee a prolific tooth exfoliation following its use in the manner recommended. But assuming that Dr.

Prinz could convince us that trioxymethylene is a valuable adjunct to a root-filling, and that when sealed in "It can do no harm, because the pulp has been removed" (Prinz), and that it has no deleterious action upon the peridental membrane—in that event I should feel that we owed him both our moral and financial support in testing-out his remedy to the limit, even though we might be a bit skeptical as to its ultimate effect.

The next order of business as announced by the President was the reading of a paper by Dr. Allen J. Smith and Dr. M. T. Barrett, Philadelphia, entitled "Emetin in the Treatment of Peridental Suppurations."

[This paper is printed in full at page 1201 of the present issue of the Dental Cosmos.]

Discussion.

Dr. E. J. Donnegan, Wilkes-Barre. In my opinion it was unfortunate that the popular press got hold of Dr. Barrett's researches, and led not only public opinion, but also very many dentists, to believe that Dr. Barrett had found a specific cure for pyorrhea. I have been told by dentists repeatedly that Dr. Barrett never made such a claim; still, the opinion is held by dentists today that emetin is a specific for pyorrhea, and they are eager to try this drug because they are looking for some remedy to cure pyorrhea—in other words, some short way to perform a long, tedious task.

As to my views in regard to pyorrhea, I am inclined to agree with almost everything that Dr. Talbot has said in regard to the etiology of pyorrhea. I think Dr. Talbot's last paper on this subject, as published in the May 1915 issue of Dental Cosmos, is very much to the point. In this paper he has asked Dr. Barrett some questions that have not yet been answered. I do not know anything about the amœba, and would not know one if I saw it, but I want to take up this question from the clinical standpoint. I would like to ask Dr. Barrett, If we extract all the teeth in a patient with pyorrhea, what becomes of the amœbæ? If this is a specific disease caused by a specific germ or parasite, why is it not easy to take care of pyorrhea? Because the teeth constitute a constant irritant in the jaw, and the whole cause of pyorrhea lies in their retention—I believe that is Dr. Talbot's theory. We must have an irritant, and we must have soil. We have to get rid of both the soil and the irritant. I think one of the greatest irritants is tartar. Why is it necessary to remove the tartar if germs play such an important part? Dr. Talbot advises the removal of all the foreign material as found around most teeth, and treatment with iodin. I can clear up most cases that way. I would not contend that emetin or that vaccines will not help, but so far as I have used emetin locally there have been practically no results. I have yet to see a case where the pus cleared up, although a few cases assumed a somewhat better aspect. I know of several cases, especially in arthritics, who could stand very little instrumentation, in whom dentists injected emetin in the arm, and who claimed that the condition had very much improved.

Just the other day a medical friend asked me what I thought of emetin; he had a number of arthritic cases suffering greatly with pyorrhea, and wanted to know what I thought about injecting emetin in these cases. I told him I thought, if it had any value, those would be the cases to try it on. His idea was to inject the drug in the arm to see whether it would help those cases which needed the dentist's care. It seems to me that most physicians know nothing about the treatment of pyorrhea, and a great many dentists know very little more. Many dentists fail when trying to treat pyorrhea surgically, because they will not devote to it the time required. I believe that dentists are much like physicians in that most physicians will not make surgeons, and most dentists will not make pyorrhea surgeons, because they have not the time, and if they had the time, they have not the dexterity. A short time ago a dentist recited a number of cases treated with

vaccines. He said he could not remove the tartar, but vaccines cleared up the case. I remarked to him that the case had cleared up for a while, perhaps, but the irritation still persisted and would have to be removed in order to procure any lasting results. I believe that malocclusion also plays a most important part in pyorrhea. We frequently see slides shown illustrating deep pockets about the teeth, and their bony support largely gone, owing, in my opinion, to the malocclusion of these teeth. To say that one drug or any number of drugs will cure pyorrhea seems more or less of an exaggeration, because we must correct the occlusion and the contact points of the teeth to prevent impaction of food between them, and we must prevent lateral stress as a part of our instrumentation, else there will surely be a recurrence of the trouble.

I have not met many cases of pyorrhea with arthritis, although I have heard of a number and have seen a few, but I have seen pyorrhea associated with many other constitutional disturbances, and in my opinion the systemic diseases produce the pyorrhea. In a number of cases I was confident that systemic diseases, such as Bright's disease and diabetes, had produced pyorrhea. A short time ago a gentleman came to me for pyorrhea treatment. I examined his mouth and found that the occlusion was normal; his teeth were perfectly sound, but there was pyorrhea everywhere. I questioned him with regard to his general health, and he seemed to be in very good physical condition. I treated his case in an effort to control the condition, but with no appreciable effects. During the course of treatment I learned that he was a great ice-water drinker. Within the last three months this patient had an attack of Bright's disease, and when he returned to me after this attack, the pockets were all open again. Why? Was it amœbæ? If it was, why did they not attack the tissues three months before?

I am sorry that I did not have an opportunity to go over the paper before the discussion, as there are a number of points with which I do not agree. Dr. Barrett several times mentioned tartar; I would like Dr. Barrett and the rest of our investigators to tell us more about diet, and general hygiene, and how we are going to control the deposition of tartar. We can remove tartar and have the tissues in a perfectly healthy condition, but in a very short time the patient will again exhibit deposits of tartar. I believe, if the tartar could be kept away, there would be no secondary infection. I believe infection to be secondary in pyorrhea: the tartar is the initial irritant in many cases, and predisposing systemic diseases are closely associated with the initial irritant.

Dr. M. L. Rhein, New York. It is always a pleasure for me to appear before the Susquehanna Society. I have enjoyed this second contribution of Dr. Barrett's as much as I did the first. This is the first time that I have discussed this subject, and it is with mixed feelings that I undertake the task. If I could have had my way, I would have prevented Dr. Barrett from publishing anything on this subject until his and any other investigations had been carried to a more complete end; but I can sympathize with his desire for priority in regard to the amœba. If we had, as mouth specialists, read the article by Bass and Johns before we had listened to his lucid paper, we should have been very indignant. I consider, knowing Dr. Bass' reputation as a laboratory researcher, that he has gone out of his way to make himself ridiculous when he published the article in the *American Medical Journal*. He starts out by making the assertion that ninety-five per cent. of all people have pyorrhea. How can we take his article seriously in its dental application when at the outset he makes such an absurd statement! It is unfortunate to have a good laboratory investigator try to use his laboratory technique in a field with which clinically he is ignorant. It is on this very account that a great many of our best laboratories have refused to take up the investigation of dental subjects. They have frequently said to me, "If you wish to obtain prac-

titioners of dentistry trained to do laboratory work to go into our laboratory, we are perfectly willing to work out this topic. There is no one in our laboratory who understands the mouth properly, and consequently no one who is fit to handle this subject." This, for instance, is the reply I have always received at the Rockefeller Institute. They are perfectly willing to take up dental subjects there, if they can find trained laboratory men willing to do such research work who are at the same time properly acquainted with dentistry—and I believe their standpoint is absolutely correct.

Whether or not amœbic pyorrhea will ever find a place in the nomenclature of pyorrheal conditions, I am uncertain at present. I have examined a great many mouths for amœbæ and have found them in a great many cases with—or, as Dr. Barrett has pointed out, without—pyorrheal conditions. Let us all emphasize Dr. Barrett's differentiation between simple gingivitis and pyorrhea. I think there is a growing tendency among that class of men who choose to call themselves pyorrhea specialists—which I think is a horrible misnomer—to call simple forms of gingivitis pyorrhea.

As for the use of emetin hydrochlorid, I waited for a long time to find a pyorrheal condition that I could not control, in order to try emetin, but I found that I would never try it at all if I waited for such a case in private practice. The dentist who conducts properly his private practice finds great difficulty in seeing the forms of pyorrhea that cannot be cured, though there are plenty of incurable cases of pyorrhea in any hospital which accepts incurable cases of vital organs. Dr. Barrett would as little as myself expect to obtain any remedial effect from emetin in a case of tuberculosis of the lung that is expected to prove fatal in a few months, or in a diabetic patient who has only a few months to live. In all hopeless cases of this nature it is difficult to conceive of the possibility of emetin being of any value.

I believe with Bass in the statement that the amœbæ are deep-seated, sometimes at the bottom of the pocket; thus this coincides with Dr. Barrett's observation, and it also coincides with my limited clinical experience. In trying to find amœbæ I never have obtained any around the gingival margin, but have always succeeded in finding them at the bottom of the pockets. I have never succeeded in finding any amœbæ in the superficial parts of the mouth, but I do not consider this at all convincing, as I do not place much value on the few experiments I have made on this line. I do not believe in passing judgment until we have gone through a series of careful experimentation and proved or disproved the claims presented by the original investigator. My objection to Bass' work is that he is incompetent to speak accurately of the tissues he is investigating. He can speak accurately about the amœba, but he does not know the local histology and anatomy of the mouth. Clinical knowledge is just as important as is laboratory research work; the two factors must be combined by men of the proper mental acumen to be able to understand both factors.

I fully agree with Dr. Donnegan, based on thirty-five years of clinical experience, that Dr. Barrett has placed too little stress on the importance of surgical work in pyorrheal conditions. This has no bearing on the fact of stoppage of the pyorrheal discharge. It is easy to stop any pyorrheal discharge from a pocket with a number of germicidal agents just as effectively as this can be done with emetin. It is possible that emetin hydrochlorid will prevent reinfection of the pocket longer than will a sublimate solution, for instance. But the superficial closure of such a pocket does not mean proper treatment of the case, in my estimation. There remains a pathogenic condition in the bottom of the pyorrheal pocket, as was so beautifully shown in Dr. Barrett's illustrations. The only way in which such a pyorrheal pocket can be treated, according to our knowledge of tooth surgery, is by the elimination of all irritants. Vaccine treatment will not change that localized

abnormal condition any more than emetin treatment, and I am sorry to see Dr. Barrett lean toward such an idea—though I may have misunderstood him—as the claim that he could effect a cure simply by emetin treatment.

The stoppage of pus discharge is not necessarily a cure. The abnormal conditions must be remedied surgically or otherwise, calculary deposits must be removed, bearing in mind, however, that calculary deposits are not all; that the adjacent tissue cannot be normal under such conditions. Only the cleanest surgical measures should be applied in pyorrheal conditions. I have for thirty-five years tried to bring about a restoration of pericemental tissues in pyorrheal pockets, and I have yet to see any genuine success in that direction, because of the impossibility of eliminating the mucous flora from the mouth. I can induce a regeneration of the osseous tissue in the alveolus in the periapical area, because there I can keep micro-organisms away, but it is different in a pyorrheal pocket. I have tried all kinds of mechanical means to keep pockets free from micro-organisms, but have failed to find any effective method. I have tried many mechanical designs and medicinal preparations, and I have essayed the interposition of various forms of dressings, but they all seem to fail, and after thirty-five years of careful work in this field I have come to the conclusion that, when the cementum has become involved in the pocket, the best thing for such a case is to remove all the soft tissues until the pocket is eradicated by pure surgery, and have the tooth depend upon what is left of sound, healthy structure; if it be only half of the root that is supported, then we must depend on the other half of the root to retain the tooth, after the patient has been properly instructed in oral hygiene so as to keep such exposed root-surface free from contamination. In many cases, with a pair of curved scissors all of the soft tissue that forms the outer wall of the pocket is removed, according to good surgical principles, in order to enable the patient to keep the mouth absolutely clean.

Dr. Barrett thinks that we have a form of pyorrhea in which the amœbæ play not only a rôle, but the only rôle. I am convinced that there are all kinds of pyorrhea, and that the infecting organism varies in different cases. I know perfectly well that the patient who has diabetes to a marked degree associated with pyorrhea has an entirely different kind of pyorrhea from a tuberculous patient. We know the important rôle the amœba has played in certain forms of dysentery, and it is possible that such a form of pyorrhea, which results from what has been badly termed auto-intoxication or toxemia, may be attended by protozoa such as Dr. Barrett has called our attention to, and that these cases may be absolutely cured by the elimination of the protozoa.

I feel that I have already taken too much time, but I want to add that, in the course of a fairly varied practice, in which a great many cases of so-called pyorrhea have been brought to me for consultation, from the poorest quarters of New York City, I have found that not ten per cent. of these cases are pyorrhea. Almost invariably, a careful examination will bring about a diagnosis of some well-defined nidus of infection at the apex of some root where the pulp has long been dead. I feel that this is of the greatest importance in discussing this subject, viz, the elimination of false diagnoses of so-called pyorrhea that is not pyorrhea. While formerly a correct diagnosis was frequently a severe tax on the ability of the dentist, this state of affairs no longer exists. The use of the X-ray has changed what was a difficult procedure into one of great simplicity.

Dr. H. M. Beck, Wilkes-Barre. So many claims have been made this afternoon for the instrumental treatment of pyorrhea that I feel compelled to recite my experience with such treatment.

I maintain that no case of pyorrhea has ever been cured by instrumentation. Years ago my father had a case of pyorrhea in his practice that was beyond his control. The lady was sent to Dr. Riggs and received the instrumentation treatment practiced by him at that time (and,

by the by, that was only slightly different from the one used today). Dr. Riggs' fee for this case was five hundred dollars. One year after this treatment the patient lost her teeth, and an artificial denture was made. In my own practice I have had a number of such cases, and have sent several patients to specialists for the treatment of pyorrhea. The result has always been unsatisfactory, and it was only a question of a year or two before artificial dentures had to be made. These patients never stopped treatment, and were using every known method to cure the disease.

As soon as I heard of Dr. Barrett's discovery of emetin for pyorrhea, I bought the drug and began its use. Before using the drug I made a slide in every case and with the microscope ascertained whether the endamœba was present. After using emetin as directed by Dr. Barrett, I found that in every case where the endamœba was present before the use of the drug, it was not found after its use: I also found that there was a great improvement in every case where emetin was used. I am not prepared to say whether the endamœba is the cause of pyorrhea or not, but I do know that it my experience, in cases where the endamœba is present and emetin is used, the endamœba disappears after four or five treatments.

I want to thank Dr. Barrett for his discovery of emetin, for his paper, and for what he is trying to do for dentistry along scientific lines. Time will tell whether emetin hydrochlorid is the specific for pyorrhea or not. After all that has been said for and against emetin this afternoon, I wish to say that in my hands it has been a more successful agent for the treatment of pyorrhea than any other I have ever used or seen used.

Judging from the discussions of this afternoon, it is very plain that the rank and file of the dental profession fail to realize and appreciate what Dr. Barrett and Dr. Smith have done for the advancement of dentistry. Through scientific research these men have discovered the emetin treatment for pyorrhea. Hundreds of people who have never paid much attention to their teeth before have read about emetin and are awakening to the importance of good teeth and perfect mastication. Medical men who heretofore never thought of looking into the mouth of a patient when making their diagnosis are now making most careful examinations of the mouth and teeth, and are advising their patients to consult a dentist. All this is bringing about a co-operation between the practitioners of medicine and of dentistry which was thought impossible ten years ago. This co-operation is due to a great extent to the results of Dr. Barrett and Dr. Smith's discovery, and I feel that the dental profession owes to these men their everlasting tribute and gratitude.

MEMBER. Do you apply emetin by injection?

Dr. BECK. I have used emetin both hypodermically and locally. For local treatment I use a small glass syringe with a platinum needle which will go well down into the pockets. The pockets are washed out very carefully with the emetin, as Dr. Barrett has described. If this local treatment does not prove sufficient, I inject a half-grain of emetin hypodermically for three days in succession; and I have never failed to get results.

MEMBER. How early in life does pyorrhea start?

Dr. BECK. My answer to this question is that pyorrhea begins with the removal of the permanent first molars. At our free dental clinic at the City Hospital we see children who had their permanent first molars removed. Owing to the extraction of these teeth the others are thrown out of position, and it is merely a question of time before the resulting malocclusion develops pyorrhea.

Dr. BARRETT (closing the discussion). In answer to the question by Dr. Donnegan as to whether the amœbæ have been injected into other animals to determine whether they will produce pyorrhea: This has not been done because of the impossibility, thus far, of cultivating and isolating these protozoa. The emetin treatment was primarily undertaken to test by indirect method the

pathogenicity of these oral endamœbæ. To the best of my information, no pathogenic endamœbæ have ever been grown as yet in pure culture.

Dr. Donnegan raised the question why, on the extraction of teeth with marked pyorrhea lesions about them, since it is not to be supposed that the removal of the teeth also eliminates the microorganisms, healing of the wound takes place. It is to be acknowledged that, from the nature of the operation in question, many of these pockets are probably evacuated when the teeth are extracted. But without entering into the details of the healing process of these as of other infected wounds, I wish to point out that healing is not always easily accomplished. I have recently had reported to me four such cases, in which healing did not take place following the extraction of teeth. In two of these I was able to obtain smears and to demonstrate the presence of endamœbæ in both; all four cases healed promptly after the application of emetin.

Replying to the question why, if tartar be not a cause of pyorrhea, I advocate the removal of this deposit, I would say that, while tartar in my opinion does not actually cause pocket formation, yet, when deposited secondarily, it can possibly be an element of irritation and should properly be removed. If the tartar deposited on the root of the tooth in a pyorrhea pocket were an efficient cause in further deepening the pocket, it should reach down to the bottom of the existing pocket; but in one of the lantern illustrations exhibited it was shown that the tartar scale does not go to the bottom of the pocket, although the destruction of the peridental membrane and cementoblasts is evidently well below the tartar. There is no objection to the removal of the tartar, but there seems little reason for the denudation of the cementum and the actual scraping of the dentin itself—as in whatever repair may follow, these elements are desirable.

Dr. Rhein. In other words, you believe you get a reattachment of the peridental membrane?

Dr. Barrett. The peridental membrane as such is destroyed, and no one with appreciation of the histology of the parts would expect a reattachment. In the healing process, however, with the formation of fibrous tissue of scar-like type, this latter may be expected to form some degree of attachment to an available cemental surface. But the mere removal of tartar deposit does not insure the healing of the pocket, according to my experience during the past few months. The difference between the emetin treatment and the isolated instrumental treatment is the same as between therapeutic and surgical treatment. One of my patients has told me that he actually spent thousands of dollars having his teeth scaled by some men most skilful in this method, but without result, his mouth remaining in a very uncomfortable condition. Within two weeks after the emetin treatment had been instituted the patient could masticate with comfort, and the pus and inflammation completely disappeared from his gums.

Dr. Donnegan. Dr. Rhein has suggested that emetin might be of value in cases of so-called auto-intoxication. In my experience, many of these pyorrhea cases have auto-intoxication, and I would ask Dr. Barrett how in such cases he would suggest using emetin—locally or hypodermatically.

Dr. Barrett. In uncomplicated pyorrhea I prefer local application of the drug, as being in my experience more effective. But when complications exist, and when there is reason to believe that amœbæ are to be found in the tonsils or elsewhere, as well as in the pyorrheal lesions, the emetin should be used hypodermically along with local treatment of the pyorrheal lesions. The views of the relationship between pyorrhea and general systemic disturbances have been discussed by the writers in the paper; but I would again urge, for my colleague and myself, that it seems more reasonable not to hold the amœbæ of the pyorrhea lesion directly responsible, but that more probably a symbiotic chain exists between these protozoa and some or all

of the bacteria associated with them, and that much of the systemic effect is really due to the toxins of the bacteria of this symbiotic group, and that the value of the emetin treatment results from the readiness with which the chain is broken by the special amœbicidal action of the drug, whatever additional value it may have in regard to bacteria.

(At the close of the discussion Dr. Beck asked Dr. Barrett whether he derived as good results from the coated pills of emetin as by the methods of administration above alluded to. Dr. Barrett indicated in reply that he had not found any of these preparations as effective as others have claimed for them.)

Election of Officers.

The next order of business was the election of officers for the ensuing year, which resulted as follows:

President—Dr. E. J. Donnegan, Scranton.
Vice-president—Dr. Walter Richards, Slatington.
Second Vice-president—Dr. D. S. Gardner, Scranton.
Recording Secretary—Dr. Geo. C. Knox, Scranton.
Financial Secretary—Dr. Geo. J. DeLong, Allentown.
Treasurer—Dr. Chas. A. Bachman, Emaus.

Motion was then made and carried to adjourn until the evening session.

(To be continued.)

MARYLAND STATE DENTAL ASSOCIATION.

Annual Meeting, held at Baltimore, Md., June 10 and 11, 1915.

The annual meeting of the Maryland State Dental Association was held in the Odd Fellows Temple, Baltimore, Md., Thursday and Friday, June 10 and 11, 1915.

The meeting was called to order at 10 A.M. on Thursday, June 10th, by the president, Dr. C. D. Sadler, Baltimore.

The meeting was opened with prayer by the Rev. R. W. H. Weech, Baltimore.

The vice-president, Dr. B. M. Hopkinson, occupied the chair, while the president, Dr. C. D. Sadler, read his Annual Address, which was referred to a committee composed of Drs. Drew, Street, and Grieves, to report thereon at a later session.

The secretary, Dr. Dunbracco, read a communication from the National Association, asking that delegates be appointed to the annual meeting to be held in San Francisco.

Motion was made and carried that Dr. B. Holly Smith be elected delegate and Dr. B. M. Hopkinson alternate.

The Secretary read a communication from Dr. Grady with regard to the movement to present from the profession a loving-cup to the Forsyth Infirmary.

Motion was made and carried that a voluntary subscription be taken for this purpose from the members of the society.

The next order of business was the reading of a paper by Dr. A. D. McConachie, Baltimore, Md., entitled "The Oral Specialist's Responsibility in Systemic Infections."

[This paper is printed in full at page 1252 of the present issue of the Dental Cosmos.]

Discussion.

L. F. Barker, M.D., Baltimore. Undoubtedly Dr. Chas. H. Mayo is right in his assertion that a great step forward can be made in preventive medicine by the dentist. While real progress has

been made in conservative dentistry, the time has now come when ultra-conservatism should be abandoned in cases where the general system is endangered by local infection in the mouth. Undoubtedly, quite a large proportion of the diseases of the digestive apparatus, of the joints, and of the nervous system, especially in middle and later life, is due to metastatic infection or absorption from pyorrheal pockets or from blind abscesses at the roots of teeth. I have seen severe cases of indigestion, of liver disease, of arthritis, of nephritis, of pulmonary abscess, and of neuritis associated with oral sepsis. Many of these cases have been greatly benefited or cured by thorough treatment of the primary infection of the mouth.

I feel sure that dentists will heartily co-operate with medical men in a campaign of preventive and curative work, and I think that consultations between dentists and medical men should be more often held than is now the custom.

Dr. Edward C. Kirk, Philadelphia. Until Dr. Smith announced the fact that I was to speak on the subject before us, I had no intimation of its being expected of me. I did not come here with any intention of speaking, but simply as a listener.

I have been very much interested in the topic of the paper, as it is an extremely important one. The propaganda which has eventuated in this paper and many others in the same line of thought, calling the attention of the dental profession to their responsibilities in this matter, received its principal impulse from Dr. Hunter's famous paper read in Montreal some years ago, in which he called attention to the specific damage that was being done and had been done by bad dental work. He showed very conclusively that defective dental work was capable of setting up focal infections in various parts of the body, which thus had their origin in disease conditions about the tooth sockets, and since then we have been giving particular attention to these matters. I feel very specifically that the article by Dr. Hunter was, in a certain sense, a counter-irritant which has been doing an immense amount of good not only in the dental profession but among our medical *confrères* by directing attention to this very important matter. We have well known from the time of Miller that the human mouth is a focus of infection. In fact Miller, as you who have read his contributions will remember, effectively drew attention to the possibility of the transmission of infection from the mouth to other parts of the body, and he also determined the fact experimentally. That formed a portion of the research work for which we are eternally indebted to him. We have since been growing little by little into a more intimate knowledge, not only of the general fact, but of the various aspects of these cases of infection, and we have incidentally accumulated evidence—overwhelming evidence—that the ground taken by the essayist is sound. It becomes now a matter of detail work in tracing out in this or that particular case just what the relationship may be, but as a general principle I think we may safely say that the possibility of remote infection having a dental origin is a demonstrated fact. Incidentally the essayist has called attention to the indictment of the tooth-brush which has recently been given a somewhat popular prominence. That involves a distinctly debatable question. Some bacteriological work has been done on the question of the tooth-brush from a sanitary standpoint, but I rather suspect that when the facts are developed by further investigation, as they necessarily will be, we shall have a situation very much the same as that portrayed in the ancient incident about Agassiz. Professor Agassiz was said to be the exponent of a fish diet for cultivation of the brain. It is related that on one occasion, in a coast town in Massachusetts, there was brought to him an idiot child, and the professor was asked, "What have you to say about this? Here is a boy who has lived on fish all his life, has had practically no other diet, and look at him!—he is an idiot. What have you to say about that in connection with your theory of fish as a brain food? Professor Agassiz'

reply was, "Yes; but have you ever stopped to consider what he would have been if he had had no fish?" I think the same line of argument might apply to the tooth-brush. Many experiments have been made by a number of researchers with reference to reducing the bacterial content of the human mouth, and the best figures that I have been able to obtain on the subject are that we can reduce the content temporarily about fifty per cent., but these mouth bacteria have a habit in proper environment of reproducing themselves to an extent that would more than satisfy the original biblical command to "increase and multiply," with the result that in an incredibly short time the bacterial content is as it was before the cleansing was undertaken. We must conclude, therefore, that bacteria are like the poor, in the respect that we have them always with us. The thing that has been interesting me the most is not why we have bacteria, but how it is that we survive under these conditions. Why do we not all die of bacterial invasion? That is to say, What is the body itself doing—what are the tissues themselves doing in an adaptive way to defend themselves against infection by bacteria? It seems to me this indicates a line of research that we need to take up quite as attentively as we do the question of bacterial invasion.

There is another feature that bears, at least correlatively, upon the topic of this paper, a phase of mouth relation to bodily disorders, to which we have as yet given too little attention; that is to say, the nervous reflexes that arise from teeth and give rise to conditions that in their way damage the tissues and so lower their resistive powers that they become subject to infection. Dental literature is in a sense filled with reports of cases of reflex disturbances that have their supposed origin in or about the teeth. These reflex neuroses of dental origin constitute a problem which is closely related to the question of mouth infection that must be taken up, and I am glad to be able to say to you that the work in this direction begun some years ago by Dr. Henry S. Upson of Cleveland, who was the author of a book on this particular dental relationship, is to be continued under a foundation established by his widow for the systematic investigation of that class of nervous disturbances having mouth origin.

I want to express my approval of what seems to be the main conclusion of the essayist's paper, and that is the necessity of intelligent treatment of these cases upon the basis of the highest efficiency in our service to the public—which, after all, is the *raison d'être* for our existence as a profession; and it is in just such inter-relations as we have seen this morning of the counsel and activities of all the specialists in medicine, along with those of the dental specialty, by which we may hope to arrive at just and proper conclusions and achieve the best results. If clean mouths will save our lives, by all means let us have them; but I find opinions much at variance, especially among medical men, as regards this aspect of the case. I should much like to secure increased respect for the teeth of the human race, from the point of view of their usefulness as masticating machines, upon the part of the medical profession. I want to see that thought started as a propaganda in medical circles and have them learn that the resources of dentistry are even today able to take care of these focal infections about the teeth without, in a majority of cases, resorting to the forceps. It would seem that the medical profession does not clearly recognize one important fact in this connection, viz, that extraction of teeth from the point of view of modern dentistry is a confession of surgical failure; that there is no more justification for extraction of a tooth because it is a focus of infection than the surgeon has for amputation of somebody's head behind the ears for headache. After it has been demonstrated that the resources of dentistry are inadequate to that end, then we may be justified in a final resort to the forceps. There is that aspect that needs to be looked into, and there should be a propaganda of the possibilities of modern dental service among members

of the medical profession, as much as there should be a propaganda of pathology and therapeutics among dentists by the medical profession.

Dr. B. Holly Smith, Baltimore. I would like to express my appreciation of the effort and the accomplishment of the essayist. It seems that we have imposed upon Dr. McConachie so frequently that it has become a habit, and we feel as if we owned him. He has given us many pertinent suggestions as to our responsibility. Dr. Barker has strongly emphasized the warning note of Dr. Mayo with regard to our responsibility. I like also what Dr. Kirk has said in this connection. It seems that the medical profession has just awakened. How many times have we knocked in vain at the door of medicine, and said, "Let us in; we have an important message." But now the door has been opened, and the presence and assistance of the dentist has been demanded. I do not contend that we should be masters of the situation, neither do I agree with those medical practitioners who demand the sole right to direct, but, as Dr. Barker outlines, the correct practice should be developed by conference between dentist and physician. I have seen extractions made in hospitals under the direction of prominent practitioners that were wholly unnecessary for the cure of the conditions found. The medical man does not understand the relation of one tooth to another, and acts on the principle that a tooth is not only unimportant, but that, when it is diseased, it is absolutely in the way of health and must be removed. Murderous and mutilating, such dicta!

Dr. J. C. Grieves, Baltimore, Md. There are some very useful thoughts in this paper in regard to consultations which we are to hold with our medical *confrère*. My quandary this morning is as to just how much modern dentistry can do. I believe it will finally do what Dr. Kirk has said, and I have faith in the ultimate result of dental surgery, but the unfortunate situation, as Dr. McConachie has pointed out, is that the dentists and the physicians are not united in their efforts in this direction, nor are we a unit as to periapical infection.

Speaking of the actual conditions at the end of the root in blind periapical abscess and its inception either via the defective canal filling or by endogenous infection, if I were called to a case in which the patient was ill enough for consultation, and the radiographs of the case showed rarefied areas at the apex of the tooth, no matter how well that tooth was filled, I should be obliged to admit that I could not handle the situation in any way but with the forceps. The perfectly filled root-canal is not the exception by any means, and there are many rarefied areas about most mechanically correct root-canal fillings; it may be an area under repair, it may be infected, but certainly, with our present knowledge, such a condition must be interpreted as the signal of some local, possibly general, damage. In many cases where the root-canals are perfectly filled, when teeth are extracted under careful conditions, because of these rarefied areas, and cultures are made, a number of forms of streptococcus have been obtained from the ends of the root. Therefore the root-canal filling, while an important factor, is not the only factor, and probably 25 per cent. of well-filled roots have rarefied areas around them. I believe we should be very careful indeed, much more careful than we have been, in the devitalizing process. At present my conception of the situation is that we often devitalize periapical tissue in attempting to devitalize the pulp, causing a necrotic area, an area of lowered resistance open to infection from any source, no matter how carefully the root is filled.

I was very glad to hear the essayist speak of hematogenous infections, because I believe that injustice has been done to the dentist in blaming infections on him for which he was in no way responsible, although that is no excuse for the devitalization of periapical tissue in an attempt to remove a dental pulp. We all know the picture of the perfectly normal tooth which by a blow has been deprived of its blood supply; it may

change color, and the pulp may become gangrenous. Frequently this process will go on for years without causing trouble, when all at once it will develop into a serious blind periapical or open abscess. This is the best illustration of the fact that periapical infection may occur via the blood stream. The metastases mentioned in the paper, therefore, will work both ways, and well-filled roots are no doubt occasionally infected secondarily, possibly from a sinus by absorption, and surely from the pharynx and the crypts in the tonsils by way of the blood-stream.

This fact, which is often used as an excuse by the dentist who is careless and dirty in root-canal work, does not furnish an excuse, for no operator should allow teeth with necrotic apices to remain in the mouth, no matter whether he produces the necrosis, or whether it is produced by infection.

The next item on the program as announced by the President was the reading of a paper by Dr. J. Kendall Burgess, New York, entitled "Modern Attachments for Bridge Work and Stabilizers for Loose Teeth."

[This paper will be printed in full, illustrated, and with the discussion which ensued, in the December issue of the Dental Cosmos.]

Dr. B. Holly Smith moved that Dr. McConachie and Dr. Burgess be made honorary members of the Maryland State Dental Association. (Motion carried.)

The meeting then adjourned until the evening session.

Thursday—*Evening Session.*

The meeting was called to order at 8 o'clock on Thursday evening, by the president, Dr. Sadler.

Dr. Sadler introduced Dr. M. T. Barrett, Philadelphia, Pa., who read a paper entitled "Emetin in the Treatment of Peridental Suppurations."

[This paper is the same as that read before the Susquehanna Dental Association of Pennsylvania and printed in full in the present issue of the Cosmos, at page 1201.]

Dr. Barrett's paper was discussed by Dr. B. Holly Smith, Baltimore; Dr. Stile, Washington; Dr. Weakley, Washington; Dr. B. M. Hopkinson, Baltimore; Dr. Hoofnagle, Washington; Dr. A. D. Crane, Washington, and closed by Dr. Barrett.

The meeting then adjourned until Friday morning at 10 o'clock.

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Devoted to the Interests of the Profession.

EDITED BY

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PHILADELPHIA, NOVEMBER 1915.

EDITORIAL DEPARTMENT.

AGAIN, OPPORTUNITY.

IN our March issue we directed the attention of our readers to the opportunity afforded the dental profession by conditions arising out of the present European war to practically demonstrate the utility and efficiency of its specialized service and to make that service indispensable.

Already much has been accomplished. The large extent to which trench fighting has been a factor of the military operations has resulted in a proportionally larger number of wounds of the head and jaws than has characterized previous wars, with the result that there has been thus created an insistent demand for the services of the dental and oral surgeon as well as for the services of the technician in the treatment of these serious cases of injury. We publish elsewhere in this issue (see page 1296) an appeal from a highly responsible group of organizers who are endeavoring to meet the crying need not only for a broadly ex-

tended dental and oral surgical service in France, but also for the establishment of that service upon a permanent and continuing basis. The statement contained in the circular that no such special hospital exists must be intended to apply only to France, as it is generally known that a number of such hospitals, both fixed and in the field, are in active and efficient operation in Germany and Austria. We are not at present in position to be able to state even in a general way to what extent this specialized service has been developed in connection with the army operations of the principal belligerents, nor how many of them have instituted it, but such reports as have reached us all definitely indicate that the demand is general and that the service is of incalculable value. In this connection it should be kept clearly in mind that, like the Red Cross or any other department of the army medical and surgical service, the work is wholly and essentially humanitarian. It is one of the ethical contradictions of war that a wounded soldier becomes to the disciple of Esculapius, even when fulfilling his office as army surgeon, no longer a belligerent, but a fellow human being in distress whose right to the ministry of healing is in nowise conditioned by his nationality or his politics. Hence it is that in the appeal to the dental profession for support sought by these multiplying centers for the treatment of injuries to the head and jaws, the demand is made upon purely altruistic professional grounds, with the total elimination of considerations of sympathy for any of the underlying or incidental questions which have originated and continued this appalling world-conflict.

Each of us may for personal reasons prefer to support this or that particular oral surgical relief station, and each of us may do so with the assurance that in whatever direction his contribution may be made, it will be utilized in its degree toward the rescue of a human life from physical agony and from the equally poignant mental distress inseparable from a disfiguring mutilation. No argument is needed to enforce the urgency of the demand upon humanitarian grounds, for the situation speaks for itself, but it should also be borne in mind that it is our individual professional duty to utilize this epoch-making opportunity to establish our professional service to the state upon a secure and permanent foundation by demonstrating its efficiency and value in the present world-crisis.

THE NEW ALABAMA DENTAL LAW.

Alabama enjoys the proud distinction of having been the first of the states of the Union to place upon its statute-books a law regulating the practice of dentistry—a fact which is practical evidence of the progressiveness of its practitioners and their wisdom in taking the initiative in providing adequate protection to the citizens of their state against the activities of the incompetent practitioner of dentistry. The same type of good sense once more is manifest in Section 12 of the new dental law of Alabama (see page 1316, this issue) by which the detailed records of all examinations of applicants for dental licensure in Alabama are made matters of public record and open to inspection by any citizen of the state for a period of five years.

Alabama is the second state, Pennsylvania being in this instance the first, to realize that the applicant for licensure has certain elemental rights that the state is bound to respect; and Alabama, like Pennsylvania, has demonstrated that she has the courage of her convictions by crystallizing her sentiments in that regard in the statutory provision constituting Section 12 of her new dental law. It is high time that the rest of the states followed these conspicuous examples and eliminated the "Star-chamber" character of the present examination system for state license.

Circular.]

URGENT APPEAL

FOR THE

Foundation of a SPECIAL AMERICAN DENTAL HOSPITAL AT PARIS, for the Relief of Sufferers from Wounds of the Face and Jaws sustained in the War.

The terrible ravages caused by wounds in the face and jaws, in the present war, bring into evidence the importance of orthodontic and surgical art. General hospitals at the outset showed but little interest in a service directed toward such a special branch of surgery, and have hesitated to ask the co-operation of conscientious practitioners. After twelve months of war, the result is that there are throughout Europe 6,490,000 wounded (official statistics issued by the War Minister on May 5, 1915), and this number is entirely too large to be coped with by the existing medical organizations, not because an urgent appeal has not

been made or because all scientific resources have not been availed of, but because the nature and number of the wounds have upset all calculations.

Here is a striking example of this deficiency: A director of a general hospital declared to one of his colleagues that it had been decided on principle not to treat any facial wounds in his hospital. This decision was, no doubt, arrived at without any expectation of so many cases requiring such special treatment.

The initiative taken by the American Institute of Dental Teachers in creating a fund the proceeds of which are to be sent to the dental hospitals of the Red Cross for starting a special service for soldiers wounded in the face, shows the admirable and practical sympathy of the United States.

At the present time no special dental hospital exists in Europe, and this is a deficiency which, with your help, we should like to make up.

It is true that some clinics exist for the treatment of maxillary and facial wounds in conjunction with various hospitals, but there is no special hospital devoted to these cases.

On May 5th, 55,770 facial wounds were recorded among the French and Belgian wounded.* Trench warfare is responsible for this large number, and the clinics to receive them are relatively few. One clinic had 193 patients on the 24th of May, and this is about the largest number that any of them can accommodate. It can be seen, then, how pressing is the need for creating a vast hospital for this purpose.

We have asked a surgeon, known for his skill in restorative surgery, to help us, and he has consented. We refer to Dr. Morestin, a member of the Faculty of Medicine of Paris and hospital surgeon. He is at the head of the service of the Val de Grâce Hospital and performs operations at Rothschild's Hospital; both his wards are more than full now. According to this surgeon's opinion, 200 beds would be occupied in less than a week by cases of maxillary fractures. Therefore, a hospital of 500 beds at least will be necessary. The greater part of Professor Morestin's time is devoted to "cleaning" operations. He cleans the faces and jaws of his patients by removing from them shrapnel bullets, pieces of bombs, etc., in order to reduce fever and infection. Actual restoration, mechano-therapeutic as well as facio-surgical, can, for the greater part, be effected only after the war, on account of the immense number of cases requiring treatment.

It is not necessary to point out how much better results would be obtained by immediate treatment. It appears, then, and with this eminent surgeon we repeat, that inestimable services would be rendered by the foundation of a hospital for wounds in the facial and jaw regions.

It is therefore important that we make every effort to arrive at this result. We can say that we have received every moral encouragement, especially from the authorities, who are greatly interested in the establishment of such a hospital. The War Minister received the members of the committee in audience. The use of a building was offered us, and dental laboratory men were guaranteed who would be indispensable for

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* Number of wounded French and Belgian soldiers 715,000 (War Office May 5, 1915), 13 per cent. of which, according to a report of the Paris Academy of Medicine, are head wounds, that is 92,950. Of this number, 60 per cent., according to moderate calculations, are face and jaw wounds, that is 55,770. To this should be added the number of Germans wounded in the facial region, prisoners in France, and English wounded of the same category as far as they are not sent to England.

our technical work. We were promised that they should be brought back from the front for our purpose.

We have been received in special audience also by the American Ambassador in Paris, who expressed by letter his favorable attitude toward our project.

Besides this moral encouragement, financial aid is necessary. Professional men are not rich. They can and will give their services and knowledge without any remuneration. We make an appeal, therefore, to well-wishers on the other side of the ocean who would like to co-operate in this great humane work for poor mutilated Europeans.

A financial committee consisting exclusively of business men has been formed in accordance with the French law regarding philanthropic institutions. There is needed the sum of $20,000 to start a hospital of 100 beds and to run it for six months.

We desire that this hospital be worthy of American prestige and of the high reputation of American dental surgery, and we have the intention of asking colleagues in America to come over and help us. Our urgent appeal now is this: "Dental and oral surgeons, orthodontists, and all American medical men interested in our hospital,—Kindly present and plead our cause with your devoted patients, so that they may give their mite toward the creation of this hospital." Both large and small donations will be greatly appreciated and can be sent to any member of our group, or to Messrs. J. P. Morgan & Co., Bankers, Wall-st., New York; Messrs. Morgan, Harjes & Co., Bankers, 31 Boulevard Haussmann, Paris, or to our treasurer, Mr. Ch. van Enter, 21 rue du Dragon, Paris.

The names of donors and practitioners will be published, and they will receive a receipt in regular form engraved by a French artist as a souvenir of their humanitarian gift.

All contributions should be addressed: "For the Special American Hospital at Paris for Wounds of the Face and Jaws."

Members of our group: Wm. J. Younger, M.D.
J. H. Spaulding, D.D.S.
I. B. Davenport, M.D., M.D.S.
H. Morestin, M.D.
J. L. André Bonnet, Ch.D.
F. J. Wilson, D.D.S.
Frank W. Williams, D.D.S.
R. Anema, D.D.S.

Paris, August 1915.

Bibliographical.

Alveolo-dental Pyorrhea. By Charles C. Bass, M.D., Professor of Experimental Medicine at the Tulane Medical College, and Foster M. Johns, M.D., Instructor in the Laboratories of Clinical Medicine at the Tulane Medical College. Illustrated. Philadelphia and London: W. B. Saunders Co., 1915.

On Tuesday, June 30, 1914, at the forty-sixth annual meeting of the Pennsylvania State Dental Society, held at Philadelphia, Dr. M. T. Barrett of Philadelphia read a paper entitled "The Protozoa of the Mouth in Relation to Pyorrhea Alveolaris." The paper embodied the report of a research conducted jointly by the author and Prof. Allen J. Smith in the pathological laboratories of the School of Medicine, University of Pennsylvania, and announced their discovery of the endamœba buccalis in the pus exudate from "forty-six cases of suppurative affection of the gums and pericemental tissue," in all of which cases without a single exception the organism under consideration was found to be present. From these findings they were led to suggest the probable etiological relationship of the endamœba buccalis to pyorrhea alveolaris.

The announcement was immediately heralded by the secular press throughout the civilized world through the medium of the Associated Press and the International Press Agency. About ten days later, to wit, July 11th, the *New York Medical Journal* devoted its leading space to an editorial announcement of the discovery of Barrett and Smith. Announcement of the discovery had been previously made in Europe through the cabled dispatches of the International Press Agency. Therefore, every dentist and physician who read the daily papers was cognizant of the facts set forth in Dr. Barrett's paper. The paper was published in full in the Dental Cosmos for August 1914, and in the September issue of the Cosmos appeared an extensive abstract of a paper on the same general subject by Prof. Angelo Chiavaro, and read by him in Paris on July 30, 1914, at the meeting of the American Dental Society of Europe.

Notwithstanding that the whole dental world, the general public, and the medical profession, as well as the manufacturers of emetin compounds, were ringing with the importance of this discovery, Messrs. Bass and Johns, on September 14, 1914, announced in a paper read before the Orleans Parish Medical Society their "independent discovery" of essentially the same findings as those made by Barrett and Smith that had been before the general public for already two months and a half. Accepting their assertion of "independent discovery," one is irresistibly impelled to inquire how long it takes on an average for the announcement of a discovery of such distinctly major importance in their own field of scientific activity to penetrate the environment of these later investigators.

We have had occasion from time to time to review remarkable books, but the

one setting forth the views of Bass and Johns on "Alveolo-dental Pyorrhea" is in our judgment easily the most remarkable product of its kind within our entire knowledge. From the seclusion of that environment into which the belated records of the work of their colleagues seem to penetrate with such tardiness and difficulty, we learn that pyorrhea alveolaris is world-wide in its geographical distribution and universal in its attack on all human beings, who without exception become victims of the disease sooner or later; that its inception is wholly due to the pathogenicity of the endamœba buccalis, which is the specific cause of pyorrhea. The authors admit that there are certain contributing factors—trauma, for example; for they regard it as "not at all probable that endamœbæ would produce disease or could affect the normal or unbroken tissue." The use of toothpicks, tooth-brushes, dental floss, chewing particles of food, etc., are among the "contributing" causes. The deduction is therefore logical that in order to avoid pyorrhea we must eliminate the above-named contributing causes; but, while the use of the toothpick, the tooth-brush, and dental floss may be objected to with some possible show of reason, what about food particles? If we eliminate the chewing of food, the death knell to ordinary mastication, not to mention Fletcherism, has been rung. The authors are "inclined to think that tartar allowed to accumulate on the teeth by insufficient hygiene may also create favorable tissue for the establishment of endamœbic infection," and yet in another chapter the statement is made that "What is called salivary calculus, and thought to be due to the precipitation of calcareous material from the saliva, is in fact due to pyorrhea. It is now generally thought to be the cause of pyorrhea, in some cases at least, but we feel certain that it will be found to be the result rather than the cause of pyorrhea." A comparison of these two quotations will indicate the general standard of consistency of the whole exhibit. Moreover, these writers call attention to a source of damage to the general health which we believe has not heretofore been noted by any previous writers. They estimate that the bleeding of the gums incident to a pyorrhea case amounts to a total of about "a gallon of blood each year," and as for pus, they estimate that in the course of about ten years, which is the period of time that is required to bring about the total loss of a tooth by pyorrhea, "about one quart of pus would be produced for each tooth, and for all thirty-two teeth about eight gallons."

These flights of imagination upon the part of the authors are constantly evident throughout the work, but are evidenced in a more graphic manner in the illustrations made from the authors' original drawings. "Fig. 11" is a "drawing suggesting the manner in which the tooth is suspended and held in its socket by connective tissue fibers running in many directions." We would amend that inscription by saying that the drawing is one suggesting the manner in which *the authors imagine* the tooth is suspended, etc., for we can assure them that the picture of the pericementum which they have drawn suggests, so far as we know, nothing in the heavens above, the earth beneath, or the waters under the earth, unless perhaps by some further stretch of imagination it might be thought to resemble some of the marginal delineations of ferns or grasses adorning the pages of Gene Stratton Porter's "Tales of the Limberlost." There is absolutely

no excuse whatsoever for such a perversion of the actual condition of things when material of an illustrative character taken directly from nature is abundantly available for illustration of the histology of the pericemental membrane. "Fig. 12" is a cross-section view of the same imaginary state of affairs, and basing their idea upon a wholly erroneous notion of the histology of the tissue under consideration, these authors explain the malpositioning of teeth arising from the inflammatory conditions connected with pyorrhea alveolaris as being caused by the destruction of the supporting fibers of the pericemental membrane on one side of the socket and the displacement of the tooth by the contraction or retraction of the sound fibers upon the opposite side of the tooth. Can it be possible, we are led to ask, that these writers have ever seen under the microscope a section showing the relative positions of the tissues with which they are dealing, and noted the relative thickness, or rather thinness, of the pericemental membrane in its relation to the root-surface on the one hand and the alveolar wall upon the other?

The mechanico-pathological bent of the authors is further manifested in the description of the morbid process by which alveolo-dental pyorrhea is caused through the agency of the endamœba buccalis. Thus, "Fig. 13" is said to illustrate the way in which an endamœba gathers up in its pseudopodia masses of bacteria and mechanically drags them into and plants them in the granulation tissue of the lesion.

The book is a fine example of pseudo-scientific guesswork, in which its authors betray among other things a notable lack of knowledge of the literature of the subject with which they have essayed to deal and concerning which they nevertheless distinctly pose as authorities. Its shortcomings are so self-evident and its hasty and ill-considered statements are so manifest that the reader may well marvel at the temerity of its writers in bringing out a work which comes perilously near to being an insult to the intelligence of the large number of scientific workers who have for years given thoughtful study and consideration to the same problem. The publication adds nothing to our knowledge of "alveolo-dental pyorrhea," though it may serve to confuse the issue in the mind of the untrained student. It can, in our opinion, serve no useful purpose other than to possibly add to the income while it detracts from the scientific reputation of its authors.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

RÉSUMÉS OF PAPERS PRESENTED AT THE SIXTH INTERNATIONAL DENTAL CONGRESS,

London, Eng., August 3, 1914.

Section III.—*Dental Surgery and Therapeutics.*

RHIZOPHOR, AN ANTISEPTIC, IMPREGNATED VEGETABLE FIBER POINT FOR THE CONVENIENT FILLING OF ROOT-CANALS. By Dr. Abraham, Berlin.

The fibers of the Piassa palm are made into fine points by suitable machinery, impregnated to avoid decomposition by zinc chlorid and creasote, and charged with crystals of thymol and formaldehyd. These "rhizophor" points are used in three thicknesses; the finest, No. 1, for bicuspid and small incisor roots; the medium, No. 2, for molar roots; and the largest, No. 3, for central and canine roots. These points are as elastic as a fine steel needle, hence can conveniently be introduced to the foramen. They should never be used in poorly cleansed canals or in case of periapical abscess. Their virtue does not consist in any chemico-therapeutic but in their mechanic action. Nevertheless, bacteriologic examination has shown mortification of all micro-organisms within two hours, the sterile condition of the root persisting after many months. Rhizophor can be employed also in pellet form for the sterilization of roots of difficult access.

Section VI.—*Orthodontics.*

NEW POINTS REGARDING THE CORRECTION OF MALOCCLUSION. By L. Subirana, Professor of Odontology in the University of Madrid, Spain.

Among the various methods in vogue for the correction of malocclusion, that of Angle enjoys the greatest popularity. The writer believes, however, that some other fundamental dynamic principles may be employed in the correction of malocclusions, which if not simpler mechanically, may render the process easier and perhaps more rational. He advocates a system which he terms automatic, and which will necessitate fewer visits by the patient. The force is applied more uniformly and more gently. The mechanical principles involved are very simple, inasmuch as a reciprocal reaction between the abutment points is established which counteracts itself. The movement of the teeth is accomplished independently without the force applied to one of them acting upon the others. In the achievement of this result, three factors must be considered:

(1) The anthropologic factor by which normal occlusion is established, and according to which the appliances must be constructed.

(2) The static factor, which concerns the items to be considered in the support, limitation, and guidance of the teeth to be moved in conformity with the normal dental arch.

(3) The mechanical factor, a physical consideration of natural or artificial dynamics acting in a slow and continual manner.

The anthropologic factor is ascertained by cutting off the abnormally situated teeth from the plaster model and replacing them on the same model according to the occlusion typical for the case.

The static factor is represented by a slight modification of Angle's expansion arch, to which some L-shaped pieces are soldered to serve as guides for the teeth to be moved and as supports for the traction bands.

The dynamic factor is considered in the application of a fine metal wire having a

spiral at each end which furnishes the traction power of the appliance.

Far from disparaging the appliances now in use, the writer believes that his apparatus offers some advantages, especially inasmuch as reactions, due to the deviation of teeth from the direction in which they are intended to be moved, are avoided.

Though the writer's clinical experience is of short standing, and his apparatus not as yet perfect, he believes he has opened a new aspect in the correction of malocclusions.

THE TEMPORARY TEETH AND THE CLASSIFICATIONS OF DENTAL ANOMALIES. By Professor Francis Jean, Paris, France.

The numerous classifications of dental anomalies permitting of orthodontic treatment are either too complicated or insufficient, or both. They all seem to disregard the temporary teeth, which play a very important part, as they are subject to divers irregularities which produce a large number of anomalies of the permanent teeth which could be either avoided or reduced if the deciduous teeth were given the specialist's attention. It is a mistake to consider the regulation of the arches only after the deciduous teeth have been shed, as the correction of dental anomalies at as early an age as possible is conducive to the best results.

A FEW ORTHODONTIC CASES. By MM. G. and H. Villain, Paris.

The writers present the results of their orthodontic treatment from an esthetic and functional point of view, their conclusions tending to show the necessity of harmonizing with each other the various factors constituting the dental system from both these viewpoints. They are opposed to the establishment of a standard, so-called ideal arch in all cases, as advocated by Bonwill, Hawley, and others, and show that the form of the arch is mechanically dependent upon the variability in the individual jaw movements, viz, their rapidity of succession and their amplitude. These movements themselves are dependent upon the shape of the canines; they determine the overlap of the incisors, the direction of the teeth, the sagittal, frontal, and horizontal curves, and the movement of the condyle. All these elements must be carefully studied before undertaking the orthodontic treatment of a case, in order to re-establish their mechanical harmony and to insure the best functional result. From the esthetic point of view, it is necessary to harmonize the different elements constituting the facies, keeping in mind individual characteristics. While fully appreciating the great value of the various orthodontic procedures, the writers advise against the advocacy of fixed and absolute methods for all cases, and demand sufficient margin to insure due consideration of the individual conditions discussed.

Section VII.—*Oral Surgery and Surgical Prosthesis.*

THE PATHOLOGY AND TREATMENT OF SUPPURATION OF THE MAXILLARY ANTRUM. By E. D. Davis, F.R.C.S., L.D.S., London.

The writer discusses the causes of maxillary antral suppuration; the rarity of suppuration of the antrum definitely due to disease of the teeth; the teeth which are usually the cause of antral suppuration; the differentiation of dental and nasal antral suppuration; the changes in the mucosa lining, the antrum and the character of the pus; the treatment of dental antral suppuration by extraction and syringing the antrum with a trocar passed from the nose; the disadvantages and causes of the failure of a treatment of antral suppuration by alveolar puncture; the operative treatment of chronic suppuration.

THE PROSTHETIC REPLACEMENT OF THE JAW. By Professor Schroeder.

The writer first discusses the prosthetic treatment in case of loss of substance in the mandible. After a brief consideration of the etiological factors involved, he emphasizes the importance of preserving the continuity of the jaw, which greatly facilitates the prosthetist's task. This continuity is often unnecessarily sacrificed in osteomyelitic cases of dental as well as of idiopathic origin. The writer shows that it is possible in such cases, even if the bone is diseased to a large extent, not only to preserve the continuity of the bone but even retention of greatly loosened teeth. A favorable prognosis regarding maintenance of continuity may also be given in cases of syphilitic necrosis, and phosphorus, arsenic, and similar intoxications. In extensive cysts

due to dental disease, Schroeder has successfully tried to preserve the continuity of the bone by filling the cleared cystic cavity with a plastic, quick-setting mass of a consistence similar to bone. In extensive tubercular bone disease preservation of continuity is impossible, and primary resection is indicated, also in necroses due to neuropathic diseases in consequence of tabes dorsalis. In neoplasms of the jaw, especially those of malignant nature, total resection is inevitable.

Prosthetic appliances are made after the wound has fully healed, and they are to be constructed so as to exert no pressure upon the fundus of the wound. Greater difficulties are encountered by the prosthetist after complete resection of the mandible, owing to the functional and cosmetic disturbances involved. The means for remedying such defects are discussed at length—viz, (1) resection bandage; (2) resection prosthesis; (3) implantation prosthesis; (4) osteoplasty—all of which have their places when indicated by the nature and extent of the disease and the operation, etc. Elaborate descriptions are given of the procedure of resection of an intermediary portion of the mandible, especially the chin portion, in presence or absence of teeth; exarticulation in case of presence or absence of teeth in the remaining portion; extirpation.

The prosthetic treatment of maxillary defects other than cleft palate is also discussed. Immediate prosthesis, as suggested by Martin, is not recommendable in the upper jaw. The reproduction of the resected portion should be made when the wound has fully healed, yet before cicatricial contraction has occurred. To prevent or palliate functional disturbances in speech and feeding immediately follownig the operation, the wound is covered by a vulcanite or rubber plate attached to the remaining teeth, which is to be constructed before the operation; this plate at the same time serves to hold the tampon and to support the cheek. For this purpose, the plate is fitted with a wing-like extension protruding into the wound.

In conclusion, the treatment of old neglected cases which have not been treated prosthetically is discussed, and ways and means are indicated by which even very marked cicatricial contractions can be expanded, and the normal shape of the face restored. Though good results may be obtained by gradual expansion, viz, rubber or spring traction, or gradual addition of gutta-percha, expansion is not always feasible. In such cases it is the prosthetist's duty to remedy the facial defects by appliances from the outside.

CLEFT PALATE. By H. P. Pickerill, M.D., L.D.S.

This paper deals with the etiology, briefly, and the anatomy and physiology of normal and cleft palate, gives original investigations in detail, reviews various methods of treatment, and describes a new method based on the above investigations. The etiology is unknown, but the cause must be operative before the eighth to the tenth week; it appears to be hereditary and cumulative in families. It may be associated with a supernumerary tooth-germ in the endo-mesognathic suture.

Varieties of cleft. The usual classification is not of much practical help; it is essential to recognize (1) the antero-posterior diameter of the oro-pharynx and (2) the relative width of alveolar processes in upper and lower jaws; on these measurements depends largely the rational treatment.

Under *anatomy and physiology* is given a description of methods of investigation. "The velum palati resembles a curtain maintained in a horizontal position by being held at four corners. At the posterior corners the levatores palati pull upward and backward, and the palato-pharyngei pull downward and backward. At the anterior corners the tensores palati and the palato-glossi pull outward and downward. The attachment to the spine of the palatal bones maintains horizontal position anteriorly." It is important to recognize that all the muscles concerned are really single digastric or stirrup-shaped muscles, and can only exert their physiological action in a normal direction when they so act; when they act as single muscles—*i.e.* divided by a cleft—the first effect of contraction of any one of the muscles is a widening of the cleft.

Investigations show—(1) That there is in reality very little forward movement of the posterior pharyngeal wall in phonation, closure of the naso-pharynx being almost wholly accomplished by retraction of the levator palati muscles. (2) That for correct phonation and articulation it is necessary to be able to shut off the mouth from the oro-pharynx by an air-tight approximation of the

dorsum of the tongue and the posterior margin of the velum. (3) That it must be possible to maintain a positive air-pressure at will, either (*a*) in the mouth and oro-pharynx (naso-pharynx shut off) or (*b*) in the oro-pharynx (mouth and naso-pharynx shut off).

Methods of treatment. (1) By forcible approximation of the tissues (Langenbeck and Brophy). (2) By obturating the space with tissue or appliance (Lane obturators). (3) By a combination of approximation and obturation (writer's method). Description.

Indications for choice of method are—*Langenbeck:* Upper alveolar arch not wider than lower; antero-posterior diameter of oro-pharynx small. *Brophy:* Upper alveolar arch wider than lower; quite young infants. *Lane:* Most rational method in all cases when infant is young and strong enough, and sufficient tissue is available. *Obturators:* Should be confined by choice to syphilitic cases. *Writer's method:* (1) Missed operation cases (infant too delicate or parents' objection). (2) Failed operation cases. (3) Normal width of maxilla with very scanty tissue. (4) All those cases where the antero-posterior diameter of the oro-pharynx is too long to be *efficiently* filled by the patient's own tissue.

The following are considered to be objections to various methods: *Langenbeck:* Retraction and tenseness of posterior margin of the velum frequently results. *Brophy:* If the width of the upper arch was originally normal, tends to produce constricted maxilla and distorted teeth. *Lane:* Operation said to be too severe for many infants. *Obturators:* Not rational in construction in that while they may obturate laterally when the muscles are at rest, they fail to do so when the muscles contract. *Writer's method:* Construction of appliance not simple. General objection that any appliance is not so good as patient's own tissues.

The special advantages claimed for the writer's method are as follows:

(1) The original function of the muscles is restored.

(2) The velum is provided, normal in size and position, movable and perfectly under the control of the muscles concerned; can be depressed to meet the tongue as well as raised to meet the pharynx.

(3) No irritation of the soft parts occurs, and there is no deterioration of the appliance.

THE PROSTHETIC TREATMENT OF HABITUAL LUXATION AND SUBLUXATION. By Zahnarzt Ernst, Berlin.

While surgical operation, the injection of iodin into the articular capsule, and hot-air therapy are of but doubtful or negative value in serious troubles due to habitual luxation and subluxation, prosthetic treatment has given extremely gratifying results. Besides Schroeder's gliding attachment, the writer recommends a ball-and-socket joint fastened in the maxilla and acting upon the coronoid process, which prevents the lateral and anterior movement of the mandible to such an extent as to prevent luxation. If in unilateral luxation, pain arises in the sound side, the writer uses Herbst's hinge joint.

A NEW SIMPLE METHOD OF TREATING FRACTURE OF THE JAWS. By Zahnarzt Ernst, Berlin.

Of intra-oral splints, which should be used whenever possible, Ernst gives preference to wire splints. As the construction of an accurate Sauer wire splint or a Hammond splint without the use of a plaster model is not always easy, Ernst and Schroeder have perfected a system which can easily be applied in almost all cases, in the maxilla as well as in the mandible.

This appliance consists of stout wire arches corresponding to the dental arch fastened to the individual teeth by wire ligatures, and especially by metal bands with Lukken's screws to the strongest teeth. If necessary, inclined planes, gliding bars, and long or short hooks for the fastening of rubber bands may be soldered to these arches with tin-soldering paste (Tinol) over an alcohol or even a candle flame. The splint can be made without making an impression and cast, which is especially important in time of war, as the excellent results obtained in the Balkan wars have amply proved.

Section IX.—*Oral Hygiene, Public Instruction, and Public Dental Services.*

THE FORSYTH DENTAL INFIRMARY FOR CHILDREN, BOSTON, MASS. By Dr. John F. Dowsley, Boston, Mass., U.S.A.

The Forsyth Dental Infirmary for children is a charity incorporated under the laws of Massachusetts, whose purpose is to furnish to

the worthy children of greater Boston the dental care which they require. It was founded by John Hamilton Forsyth and Thomas Alexander Forsyth in memory of their brothers, James Bennett and George Henry Forsyth. The board of trustees is made up of four business men, two physicians, and four dentists, one representing the Philadelphia dental schools, one representing the Baltimore dental schools, and one representing each of the local dental schools in Massachusetts—Harvard and Tufts.

This institution is dedicated to the children. It is the purpose of the foundation to care for mouth conditions in worthy children under the age of sixteen years. Its functions will include not only the care of the teeth, but also related oral diseases, including defective palates, adenoids, etc. Much of the work it will be called upon to do in its early years will deal with the curing of already established processes. When established processes are under control it is expected that it will have to do in great part with the prevention of defects by oral prophylaxis. The building which will house the foundation is under construction on the Fenway. It is intended as a memorial to the dead Forsyth brothers, and is fittingly monumental in character. When completed it is the consensus of opinion that it will be one of the most ornamental structures in the city. The trustees for the past four years have bent all their efforts to make its appointment so complete that its equipment will be adequate for the herculean task which this new work will entail. Nowhere in the world up to this time has an attempt been made to care for the dental requirements of the children of a great city. Small clinics have been established in many cities, but nothing on a similar scale is in existence.

Many new problems have had to be met, since the character of the institution has necessitated the creation of agencies hitherto uncalled for. The board of trustees has met many of the old problems as though they were new ones, and the equipment of the institution will be marked by many (and some revolutionary) changes from standard devices. The main problem has been the question of supplying expert dentists for carrying on the details of the work. This problem we believe we have solved by adopting the methods demonstrated to be successful in public medical institutions. The foundation of successful work in hospitals dealing with acute conditions is the house officer. He is a recent graduate in medicine who gladly gives his time to the institution in return for the experience gained. The dental school clinics try to supply a similar demand in dentistry, but not always adequately. Post-graduate training in dentistry is rarely obtained except through opportunity to assist dentists in their offices. The average dental student goes directly from the dental school into the practice of his profession.

The generous endowment of the Forsyth Dental Infirmary outside of the cost of the building will permit of the employment of recent graduates in dentistry at a small salary. On completion of a satisfactory service of one or two years each of these members of the permanent staff will be given a diploma certifying his service. It is believed that this service, with its opportunities for splendid experience, will attract picked men from the dental graduates of the whole country, and further, will train a group of experts on oral prophylaxis whose influence on the profession will be widespread. The number of dentists whose whole time can be paid for in this way will be necessarily limited. Among recent graduates who are practicing in this city are many, however, whose time is not wholly occupied by their practice, and who would be willing to give half time to the institution for a small remuneration. They, with the whole-time men, will constitute the permanent staff.

A volunteer staff will be made up of dentists who are willing to give one-half day per week, or per two weeks or per month, to charity. In order to draw to this service the eminent members of the local profession, it is intended to make the institution a clearing-house for the newer things in dentistry. Here will be concentrated an enormous amount of clinical material. It is our purpose to invite experts who are dealing with dental problems in any part of the world to come to Boston and report the results of their experience. Clinics will be held by experts in the various branches of dentistry, and the busy local practitioner will be kept in touch with dental progress. In other words, he will be given the opportunity which the general practitioner in medicine seeks when he takes post-graduate instruction, or which the visiting

physician to a hospital obtains as the result of his connection with the institution. It is recognized in medicine that public hospitals in which clinical teaching is practiced do better work for their patients. The members of the visiting staff of such an institution are compelled to keep in touch with modern progress, or be subjected to the criticism of students. Their patients profit by the mental exactness which such training develops. The value of such continuous instruction to the dental profession of Boston cannot be overestimated. Its value in turn to the children who come under their care should be a tangible asset to the institution.

Men who would be unwilling to devote time to the deadly routine of one or two chair clinics should find in this central clinic, with its perfect facilities and large *clientèle*, so potent an attraction that the difficulties which the small clinics are suffering in obtaining volunteers will not be met.

The research department of the institution is supported by a fund set aside from the rest of the endowment, and should add materially to the world's knowledge of dental conditions.

From the practical standpoint the following figures may be of value: The institution will start with an equipment of 64 chairs, which may be increased to 108 as needs demand. It is estimated that each chair will care for 12 patients in an eight-hour day. This allows for more than a single filling if necessary; 708 patients per day can be treated with the initial equipment according to this schedule. With 300 working days per year, 212,400 operations can be carried out. This will allow for three treatments annually of each of 70,600 children. With full equipment 371,600 operations can be carried out, or three treatments annually of each 123,866 children.

This foundation seeks the good-will of the sister professions, medicine and dentistry, and looks for their co-operation in its effort to uplift the physical standard of humanity.

ORGANIZATION OF ORAL HYGIENE IN THE SCHOOLS OF DÜSSELDORF, AND IN GERMAN URBAN AND RURAL COMMUNITIES. By Dr. F. Kehr, Düsseldorf.

Dental hygiene in the schools of Düsseldorf is taken care of by a municipal dental school clinic under the direction of a school dentist, whose time is exclusively devoted to this work, and who is entitled to a pension. The dental care of the school children consists of three main divisions: Dental examination of the children, instruction in oral hygiene, and dental treatment with the aim of saving as many teeth as possible and of complete mouth sanitation. In most German cities, oral school hygiene is organized in the form of clinics, of which there are about one hundred. In smaller cities and rural communities—about 130—part-time dentists are engaged. Only a few cities—thirteen—have recently introduced, by way of experiment, the system of the selection of dentists at the parents' discretion—the so-called Mannheim system. The writer considers the first method as the most rational, since under that system the children leave school with a perfectly healthy mouth and with a fair promise that they will continue in later life in the habit of oral cleanliness acquired and practiced throughout their school years. The establishment of a municipal clinic under the direction of a school dentist experienced in this specialty seems to come closest to the ideal. This director will carry out the dental examination of the children according to certain principles, and in close co-operation with the teachers. This system also insures best uniform results in regard to instruction in oral hygiene and dental treatment. In smaller cities and in the country the employment of part-time dentists is inevitable; successful sanitation and education of the children, however, cannot be achieved in the same degree as under the clinic system. The discretionary selection of a dentist according to the Mannheim system has not proved to be very satisfactory, chiefly owing to a lack of uniformity and an undue accentuation of the material profit for the dentist intrusted by the parents with the treatment of the child. The writer concludes by recommending for universal adoption the school dental clinic system, as outlined above and adopted by the Wirtschaftlicher Verband Deutscher Zahnärzte.

THE EFFECTS OF DENTAL TREATMENT UPON PHYSICAL DEVELOPMENT AND NATIONAL HEALTH. By Dr. R. Lemière, Paris.

The movements of general hygiene and of physical culture have become a fad; yet the

aims of dental hygiene have not as yet received the same favor, although its social importance is far greater than is generally imagined. A sound denture insures proper nutrition, sound development, or the maintenance of a good state of health. A septic mouth is especially nocuous to the digestive and the respiratory tracts. Moreover, such sepsis may produce symptoms of septicemia, causing abscesses or inflammatory conditions which may prove fatal. Considering the general prevalence of dental caries, it may be said that 95 per cent. of our children are liable to such diseases. The usefulness of combating dental caries is incontrovertible, as well as is that of the propaganda of oral hygiene in the schools, the army, the dispensaries, and the prisons. The beginnings of dental school clinics ten years ago were quite modest; despite their rapid extension, it is still difficult to determine exactly their influence upon physical development and national health. Nevertheless, their beneficent influence is indisputable, and although they cannot be demonstrated mathematically, the advantages of oral health for the individual of every age can be plainly shown in regard to the digestive and respiratory organs, the organs of the senses, general health, and physical development. Although numerous starts have been made by the public powers of various countries, dental hygiene has found only limited official recognition, and it is through private initiative that the movement has gained greater impetus in England (Cambridge), in Germany (Strassburg), in the United States (Chicago), and in France. The practical means most suitable for the propagation of oral hygiene are national committees on oral hygiene, supported by the efforts of all dental societies; discussion of oral hygiene topics at dental meetings, special conferences, prizes; formulation of plans by congresses and efforts toward their adoption by the public authorities; moving pictures, lectures, newspaper publicity.

DENTAL HYGIENE AND THE PUBLIC.

By Professor Francis Jean, Paris.

Public dental hygiene constitutes the *ensemble* of theory, practice, and popularization of the proper means for the preservation of dental health by the prevention of dental caries and its complications, whereby individual health and normal development are greatly increased, insuring an amelioration of the health of the masses. Dental societies have been appreciating, studying, and teaching this portion of dentistry. They have established rules and means for the propagation of oral hygiene in their ranks by means of clinics, dispensaries and professional journals, yet these clinics and dispensaries, while of great value to the dentist, have proved of only limited value. The proceedings of these societies have been entirely inefficacious, as they reach only a small number. The state boards can hardly take up the matter of public dental hygiene with sufficient vigor, their chief vigilance being directed toward the protection of the masses against unlicensed practitioners. In the writer's opinion, dental schools, dental societies, federations, and congresses are and can be only agents of scientific progress; the state boards, reviews, and journals are corporations for propaganda, protecting and urging the work in public dental hygiene. Societies in which the public and the profession intermingle must be the agents of propagation of dental hygiene, as they are the intermediaries between the public and the specialist. It is through this agency that the Association Française d'Hygiène Dentaire expects to obtain results.

SUGGESTIONS FOR THE CONDUCT OF STATISTIC EXAMINATIONS OF SCHOOL CHILDREN.

By Dr. Konrad Cohn, Berlin.

Examinations of school children generally show the great prevalence of the destruction of teeth by caries, the findings usually being from 90 to 95 per cent. of carious teeth. This mode of counting carious teeth, however, does not permit of detailed comparisons. Since dental charts usually do not permit of making finer distinctions, the writer marks the dental chart of a child of fourteen years, for example, as follows:

c z c g g g g g g g c c e c
o g c z g g g g g g g c f f g

c, meaning *carious*; z, *broken-down* (only roots left); g, *healthy*; e, *extracted*; o, *not yet erupted*; f, *treated and filled.*

In this manner, Professor Jessen in Strass-

burg and the writer in Berlin-Moabit have examined children of eight and fourteen years of age in order to establish the condition of the teeth during the years of compulsory school attendance, and in order to draw a comparison between the state of health in these two cities, of which Strassburg has had organized dental school hygiene for 11 years, Berlin-Moabit none. The results obtained are not given by the writer.

ARMY DENTAL TREATMENT. By Dr. Von Loos, Strassburg.

Army dental treatment is a subdivision of army health service, which is demanded not only for humane reasons, but also as a result of modern dental science. Its objects are, first, care of the mouth as a defensive means against the spread of caries, its sequelæ and systemic complications; second, therapeutic treatment, consisting in sanitation of the oral cavity by extracting hopeless teeth, filling carious teeth, arresting caries at an early age in military preparatory schools, and combating diseases and injuries of the mouth; third, dental prosthesis in cases of serious defects in speech and mastication.

Care of the mouth by the individual is prescribed by the military authorities of all civilized countries, and its enforcement is a duty of the officers and military surgeons. It is desirable that every soldier be furnished with a tooth-brush; dentifrices are less commendable. Sanitation of the mouth whenever found necessary is conducted by a dental specialist under supervision of a military surgeon. Considering the frequency of caries among soldiers, such sanitation cannot as yet be enforced generally. The general adoption of dental service is desirable in the interest of general prophylaxis. While the treatment of diseases and lesions of the mouth may be left to the military surgeon, the co-operation of a specially trained dentist cannot be dispensed with. Artificial dentures are supplied according to individual and administrative conditions upon recommendation of a military surgeon. The rôles regarding the practical execution of military dental hygiene are distributed as follows: Men and officers are obliged to practice hygiene of the mouth; the military surgeons are in charge of the supervision and direction of all oral hygiene; in co-operation with dentists the military surgeons supervise dental treatment. Since military dental hygiene is a division of the health service, military surgeons must be educated in the principles of dentistry. The dental service must be enlarged to afford greater facilities for dental conservative treatment of soldiers; dentists doing military service should therefore be assigned to the health service as aids to the military surgeons. Organization regarding rank, etc., must be left to the military authorities. The appointment of dentists in peace guarantees abundant prosthetic service in war. The conservative treatment of teeth in war is of secondary importance, and temporary relief can be given by military surgeons.

During the last ten years the great European powers have provided the following dental organizations:

Germany. Since 1906, dental departments have been established in garrison hospitals of the corps headquarters and large stations. The establishment of dental departments in every division headquarters has begun. In other stations, civilian dentists have been engaged to administer dental treatment in the military hospitals. Dental treatment is given either upon the men's request or upon the military surgeon's order. In the year of 1912–13, 80,000 cases were treated. Prosthetic treatment is given whenever necessary for preservation or increase of efficiency, also in case of loss of teeth during service. Officers enjoy unlimited dental service. Dental courses are given for students in the military surgeon's schools and in the graduate schools for sanitation officers. Military surgeons are assigned to university institutions to study dentistry and acquire the dental degree. These men practice dentistry with the cooperation of one-year-volunteer dentists. In time of war two dentists are assigned to the hospital of every army corps.

England. Since 1910, fifteen dental clinics have been assigned to garrison hospitals. Dentists are engaged as military officials. The men's teeth are treated to a limited degree. [The correctness of this information is not guaranteed by the writer.]

France. Since 1907, dental clinics have been established in the garrison hospitals, also in regimental infirmaries, yet the number of dentists appointed is insufficient. The

men are treated upon request and with the consent of a military surgeon. Courses for prospective military surgeons are given in the stomatological department of the Val de Grâce, and in the Medical School of Lyons. There is a small number of military surgeons who hold the dental diploma. Dental treatment is given by dentists while doing their military service. It is planned to incorporate them as graduates, and to assign them as adjutants to the chiefs of field hospital units.

Italy. Dental clinics have been assigned to the large military hospitals in Florence (1900), Rome (1912), and Milan (1907).

Austria-Hungary. There are 27 dental ambulances in the garrison hospitals, and three in Vienna, also in the military schools and the majority of regimental infirmaries. Conservative dental treatment and prosthetic treatment in case of loss of teeth during service is given; for officers dental service is unlimited. Dentistry is practiced by medical graduates exclusively. Dental education is given in the military medical schools, and military surgeons are assigned for instruction to university institutes.

Russia. Efforts are being made to educate the army surgeons in dentistry and to establish a dental service.

SECTION X.—*Dental Education.*

DEONTOLOGY: THE SCIENCE OF DUTY. GENERAL CONSIDERATIONS. BY DR. E. ROSENTHAL, BRUSSELS.

The practitioner's duties are defined by the writer as follows:

(1) Duties toward society on account of the benefits derived from the efforts of his ancestors to improve the conditions of life, and on account of the protection and the privileges which he enjoys.

(2) Duties toward his profession on account of the progress realized by his antecedents; the moral obligation to hand to future generations an improved science and advanced methods; the resources afforded to him; the spirit of professional solidarity.

(3) Duties toward his patients on account of the confidence placed in him; humane sentiments; the living afforded.

(4) Duties toward himself on account of his ability to lead a comfortable life and to receive just remuneration for services rendered; his own good health.

These principles should be propagated by courses given in the dental schools; by resolutions presented before dental societies; by articles on this subject to be published in dental journals.

PERISCOPE.

Sealing Medicaments in Teeth.—A pledget of cotton rolled in thick chloro-percha is superior to cotton and sandarac for sealing medicaments in cavities.—*Dental Digest.*

Varnish for Silicate Cement Fillings.—A good varnish for protecting silicate cement fillings against moisture may be made by dissolving sticky-wax in ether.—R. S. BOYS, *Commonwealth Dental Review.*

Saving Rubber Dam.—In cutting rubber dam for the anterior teeth, a great saving can be effected by cutting it three-cornered. A square piece is folded and cut diagnonally from one corner to the other.—J. C. HOPKINS, *Pacific Dental Gazette.*

Use of Old Burs for Removing Fillings.—Worn-out burs, by a few minutes' work, can be made into very useful instruments for removing old amalgam or other fillings, thereby saving good burs. They can be made into either straight or bi-beveled drills.—J. C. HOPKINS, *Pacific Dental Gazette.*

Removing a Broken Drill from a Root-canal.—A hole is drilled alongside the broken drill, deep and wide enough to admit a small wheel bur. The wheel bur is held against the shank of the broken drill, and the engine is turned backward. The teeth of the wheel bur engage the shank of the drill, which is rotated and thus unscrewed.—S. J. SPENCE, *Dental Digest.*

Xylol for Dissolving Gutta-percha Cones from Imperfectly Filled Root-canals.—Dr. Zierold of Minneapolis has suggested the use of xylol for dissolving out gutta-percha cones in imperfectly filled root-canals. It seems to work admirably.—*Dental Review.*

Separating Modeling Compound Impressions.—In taking modeling compound impressions, the compound may be easily separated from the cast if the impression is painted with a thin solution of shellac before it is poured. A most perfect impression may be obtained if the compound is vaselined and held under a stream of hot water for a few seconds just before the impression is taken.—R. Davis, *Dental Review.*

Bridge Work Complicated by Teeth Tipped Forward.—Teeth which have tipped toward a space, or have been pushed out of vertical direction by force of a faulty bite, complicate bridge work considerably. In some cases the teeth can be sufficiently ground to bring them in line for a bridge; but in extreme cases it is generally necessary to use special construction, such as a two-piece bridge with interlocking device, inlays with posts for abutments, or removable rings.—J. F. Hovestadt, *Journ. of Allied Dental Societies.*

Finishing Synthetic Porcelain Fillings.—The instruments used in reducing the size of a synthetic porcelain filling should be the same as those used for reducing the bulk of a gold filling. The manufacturers advise not to use any steel instruments in the finishing of these fillings. They only suffer from a nightmare, as we have either inserted or supervised the insertion of hundreds, perhaps thousands of these fillings, and have yet to see the first synthetic porcelain discolor when care was used during the mixing process.—C. Davis, *Western Dental Journal.*

Obtaining Correct Bite.—It is often difficult to persuade a patient who persistently pushes his lower jaw forward to bite in something approaching the proper position. We have all heard and tried many tips concerning this, but if others fail, the following procedure will often be successful: Ask the patient to sit up in the chair well away from the head-rest, to throw his head back as far as possible, looking up to the ceiling, and to close his mouth in the most comfortable position he can. If he thrusts his mandible forward now, it will only be by a determined effort to do so.—E. Holman, *Brit. Dental Journal.*

Method for the Control of Post-anesthetic Nausea.—Believing the nausea following anesthesia to be due to the smell of the anesthetic, Lumbard has devised a simple method whereby a piece of gauze impregnated with perfume is attached to the patient's nose after the anesthetic has been administered. Lumbard claims that this method is highly efficient in preventing nausea. The selection of the perfume depends upon the liking of the patient. In his own practice, the author prefers the oil of bitter orange peel.—*Med. Record,* per *Amer. Journ. of Surgery.*

Sterilizing Instruments and Keeping Them Ready for Use.—Gerson, for a period of one minute, with cotton dipped in tincture of soap, wipes off the instrument, and then repeats the procedure with fresh cotton. Each instrument is then wrapped separately in fresh cotton dipped in the tincture of soap, and the instrument is laid away ready for use at once or even after an interval of several weeks. This method has stood the severest tests, he says, and has proved entirely satisfactory in fifteen years' experience with it.—*Medizinische Klinik,* per *Journ. Amer. Med. Association.*

Information Wanted on Inherited Hare-lip and Cleft Palate.—We are studying the inheritance of hare-lip and cleft palate. So far, we have been unable to obtain data of children when both parents showed one or both of these abnormalities. Information is wanted on the inheritance of hare-lip and cleft palate in families in which both parents are affected. Descriptions of the abnormalities of both parents are desired, and especially the total number and sex of the children, both normal and abnormal. (S. L. Mason and D. F. Jones, Bussey Institution of Harvard University, Forest Hills, Mass.)—*Journ. Amer. Med. Association.*

Some Special Uses for Soap.—A small piece of pure soap will be found useful in many ways during operations. The mouth-mirror may be kept from clouding by coating the glass with dry soap and then wiping clean with a dry napkin. The edge of a sandpaper disk will not catch in the rubber dam when polishing fillings if it is first run in the soap. Disks and strips will cut faster and with less friction. Disks and strips thus prepared that are used in polishing gold will retain the particles of gold, and if saved and refined will more than pay for the trouble. Use pure soap sparingly, and it will not be disagreeable to the patient.—J. C. Hopkins, *Pacific Dental Gazette.*

Requirements for the Correct Taking and Interpreting of Radiographs.—In order that a dental radiograph—or any radiograph, for that matter—may contain the elements for a correct interpretation, it must be taken by one fully conversant with the result desired. In other words, the operator must have knowledge of the clinical phase in order to apply the technique necessary to demonstrate the condition, if present in the radiograph. Radiographs often present a good gross picture, but fail in the detail necessary for finer definition. This is apparent in many cases of abscesses, and more particularly in necrosed teeth. That much of this distortion may be minimized, or absolutely prevented, an exact technique is necessary.—E. J. Eisen, *Journ. Nat. Dental Association.*

Disease of the Eyes and Dental Caries.—Dr. Lucie Oesterreicher, in a report of the German eye clinic of the University of Prague, reports the observation that almost all patients suffering with eczematous ceratoconjunctivitis also show considerable dental caries. Nutrition suffers through putrefaction, through the constant ingestion of products of decomposition, as well as through the impossibility of normal mastication, by which any existing "exudative diathesis" is increased. It is possible that an hereditary lack of potassium sulfocyanate in the saliva partly explains the phenomenon of exudative diathesis and its cause. Of fifty cases observed, thirteen showed a total absence or reduction of potassium sulfocyanate. After two weeks of KCNS medication, continued for two more weeks after one week's interval, the KCNS content of the saliva was found to be and remain normal. It seemed as if in the majority of cases, KCNS medication abbreviated the course of the ocular trouble, and the absolute innocuity of such medication was established beyond doubt.—*Prager Mediz. Wochenschr.* per *Deutsche Monatsschrift für Zahnheilkunde.*

Silver-Plating Solution.—Dissolve silver nitrate crystals 2 oz. in distilled water 4 pints, and add a 20 per cent. solution of potassium iodid as long as it produces precipitation. Collect the precipitate and wash it until free from nitrates; then dissolve it in hot strong solution of 99 per cent. potassium cyanid. Use only just enough of the cyanid solution to dissolve the precipitate, then dilute the solution to 1 gallon. For use this solution is warmed to about 180° F., and the articles, thoroughly freed from grease, are immersed in it for about two minutes. Another formula consists in dissolving 20 gm. silver nitrate in 60 gm. nitric acid, adding a little water and precipitating with a solution of caustic potash 20 gm. in distilled water 50 gm. The precipitate is collected, washed, and dissolved in a solution of potassium cyanid (99 per cent.) 100 gm. in a very little water, finally diluting to 2 liters. Some of the liquids of this description contain a considerable amount of Paris whiting, which is meant to facilitate contact of the solution with the metal when applied with a cloth pad, and it also has a polishing effect. For this purpose, run into the stock bottle enough of the powder to occupy about a third of the space, fill up with silver-plating solution, and shake well.—*Pharmaceut. Journ. and Pharmacist,* per *Brit. Journ. Dental Science.*

The Use of Floss Silk in the Dental Toilet.—In the use of the floss silk, one should first rub tooth-powder into the dental interspaces and then pass the floss gently down to and under the gum margin of one tooth without forcing into it so as to produce mechanical injury. The floss should then be bent as nearly as possible half way around that particular tooth, and then with a slight sawing motion be slowly wiped over the entire approximal surface and part of the buccal and lingual as the floss is drawn toward the occlusal and out between the teeth. Next the floss is passed into the same space, and the adjoining tooth cleansed. The performance of the act once a week should be supplemented by the use of a thin rubber band nightly, as it is soft and less injurious mechanically than the floss.

For facilitating the introduction of floss into bridge spaces which cannot be entered occlusally, a twisted wire bodkin is valuable. It is made by first forming from an old Gates-Glidden drill a buttonhook-shaped tool, the temper being of course first drawn. Over this hook is thrown a six-inch hoop of fine regulating wire. The wire ends are held in the left hand close to the hook. The hook is slowly revolved in the engine handpiece and, as the wire twists it, is drawn through the fingers. The loose ends are cut off. Its chief virtue lies in the curve which may be given it, best in line with the flat side of the "eye." In use it is passed through any space and its curve causes it to return to the front of the mouth to be easily grasped and drawn through. The doubled floss is then used for the cleansing of all surfaces, especially for the joint at the abutments. It is also useful for cleansing the lingual surfaces of fixed bridge work if properly formed.—O. E. Inglis, *Garretsonian.*

The Emetin Hydrochlorid Question in the Treatment of Pyorrhea Alveolaris.—It is necessary in the interest of science that we study endamœba buccalis more thoroughly, to determine, if possible, whether or not it is an etiologic factor in periodontal diseases. More extensive experimental work should be carried on with the emetin hydrochlorid treatment, in order that we may know whether the improvement which is noticed in the tissues is the result of the destruction of the endamœbæ by this agent, or is due to the removal of the calcic deposits from the cementum. The published reports of those who advocate the emetin treatment clearly state that, although they have succeeded in destroying the endamœbæ, they have failed to obliterate the pockets which contained them. Periodontal diseases are not cured until the pyorrheal pockets have been entirely obliterated. It has been found that the separated tissues will form a reattachment to the roots of vital teeth when proper surgical assistance is given. This reunion removes all traces of the pyorrheal pockets. Since this reattachment of the tissues can be secured to the roots of living teeth without the aid of endamœbicides, it would seem that such healing does not depend on either the absence or presence of endamœbæ, but entirely on the character of the tissues and the thoroughness of the surgery.—T. S. Smith, *Journ. Amer. Med. Association.*

Tongue-chewing.—Dr. B. Myers, in an article in the *British Journal of Diseases of Children*, notes that this condition consists in the chewing of one side of the tongue by the teeth after practically the identical manner in which some children chew gum. In the process, the premolars and molars of the involved side of the jaw move inward over the tongue for about one-quarter of an inch, and then glide over until the upper and lower molars are in apposition again; then the movement is repeated. The rate is about ninety per minute. The chewing movement may be kept up for a few seconds or minutes, or for half an hour. It may be performed once or twice daily, or intermittently, at various intervals. The repetition of the habit makes part of that side of the tongue distinctly red, and occasionally inflamed and indented. Tongue-chewing is first noticed about the second year of life, and persists until middle age, or perhaps through life. It tends to be less noticeable with advancing years. Either sex may suffer from it. It occurs, apparently, in healthy families in which certain members suffer from habit spasms. Several members of one family may suffer from it. The habit is inherited, as far as one can see, and not copied. The same side of the tongue is always chewed in the same individual. The mental condition is quite normal, and the general health is not interfered with in any way. Bromid stops the tongue-chewing, but in time, after the patient leaves off the drug, the habit recommences.—*Journ. Med. Soc. of New Jersey*, per *New Jersey Dental Journal.*

Method of Identification of Endamœbæ in Dry Smears.—The material collected from the pyorrhea pocket is smeared in the center of a glass slide and allowed to dry; is passed quickly through the flame of a Bunsen burner five or six times in order to fix it firmly on the slide; stained cold with carbol-fuchsin solution for fifteen seconds; washed with water and stained with Löffler's methylene blue solution for thirty seconds; washed with water; blotted gently with filter paper; dried and examined, preferably with a 1/12-inch oil immersion lens and an eyepiece of such a power as to give a magnification of approximately 500 diameters. This method of double staining gives results which admit of a ready differentiation of amœbæ from the pus cells and epithelia—about the only elements which are liable to occur in such materials which might possibly be mistaken for amœbæ—and also stains the bacteria very satisfactorily.

Amœbæ, when thus prepared, are usually two or three times the size of pus cells. They appear round or ovoid, and are occasionally surrounded by a clear zone. Their rims take a blue or purple stain, while their inclusions stain pink or light red. The interior of the amœbæ frequently resembles a network which stains a pale blue, much lighter than the rim. Pus cells, on the other hand, may be distinguished as follows: The protoplasm or body of pus cell stains a rather indefinite pale pink, and contains two, three or four irregular-shaped nuclei which stain dark blue. They are usually present in abundance, whereas from one to six amœbæ may be found in some fields and none in others. Epithelia, occurring in such proportions, are usually much larger than amœbæ, and have a single nucleus. The protoplasm stains pink and the nucleus blue. In this connection it should be kept in mind that cells often take up stains differently in different parts of the same preparation, especially where there is considerable difference in thickness. Therefore the colors will not always be just as described, but in fairly thin preparations they will usually be found so.—T. Le Cléar, *Items of Interest.*

Obituary.

DR. GEORGE W. MELOTTE.

Died, after a brief illness, July 25, 1915, George W. Melotte, M.D.S., of Ithaca, N. Y., in his eightieth year.

Dr. Melotte had been in failing health for some time, and was compelled to retire from active practice about eight years ago. Although the infirmities of advancing age were beginning to tell upon him, yet the sudden end, with only an hour's illness, was unexpected.

Born in Watertown, N. Y., a son of Gabriel Melotte, a native of France, he was educated in the Jefferson County Institute, studied for his profession under Dr. S. M. Robinson at Watertown, and afterward moved to Potsdam, where he practiced for five years, and came to Ithaca in 1866. In 1887 Dr. Melotte was awarded the degree of Master of Dental Surgery by the state dental board of censors. He was a delegate of the United States to the International Medical Congress, section of Dentistry, at Berlin in 1890, and there acted as a clinical demonstrator. While in Europe he gave clinics in Paris and London, and before the British Dental Association at Exeter, demonstrating crown and bridge work. Just before his health broke down he had accepted the appointment of dean of the Dental College of Iowa State University.

It was as an inventor of dental appliances that he became known throughout the dental world. This reputation was due to a natural mechanical talent. He gave to the dental world fusible metal and Melotte's moldine. A company was formed and these inventions were placed upon the market through one of the largest dental supply houses in the country. For many years he was active in the Sixth District Dental Society.

Said the *Weekly Ithacan:* "Dr. Melotte's practice in dental surgery was, in method and appliances, in advance of his time, his contributions to the profession winning him fame and favor throughout the state and nation."

In Ithaca he was a leader in several fraternal orders, also in St. John's Episcopal Church, in which he served as vestryman for twenty-seven years. While in Potsdam he affiliated with Racquet River Lodge, No. 213 F. and A. M., afterward transferring to Fidelity Lodge No. 51, in Ithaca, and joining Eagle Chapter No. 58, R. A. M., in 1867, St. Augustine Commandery No. 38, and Ithaca Lodge of Perfection. For nearly thirty years he was prelate of the commandery, and in 1890 served as its eminent commander. He was prominent in Oddfellows circles, having served as noble grand of Ithaca Lodge No. 71, and chief patriarch of Iroquois Encampment No. 16.

Dr. Melotte was a public-spirited, good, and useful citizen. He was not only a leader in the professional life he had chosen, but was ever an uplift in the social, political, and religious life of the community. There has been "only one Dr. Melotte," has been truly said; "he will be missed by those who knew him best." Three daughters survive him. His funeral was conducted by St. Augustine Commandery No. 38.

F. M. Willis.

DR. WILLIAM J. REYNAR.

Died, September 4, 1915, at his home, Boonton, N. J., of cancer, Dr. William J. Reynar.

Dr. Reynar was born of English and French Huguenot parentage at Three Rivers, Quebec, Can. He was educated in private schools, and, after coming to the United States, entered the National Dental College at Washington, D. C., from which institution he was graduated in 1888. Deceased enjoyed a lucrative practice in Boonton, N. J., where his demise occurred.

DR. HEREWARD BURBRIDGE.

Died, September 9, 1915, at his home, Woodstock, Vt., of diabetes, in his forty-fourth year, Hereward Burbridge, D.D.S.

Dr. Burbridge was born of English parentage, on August 9, 1872, in Walthamstow, Eng., and came to Canada at the age of

fifteen. From there he came to Windsor, Vt., and began the study of dentistry in the office of Dr. Williams and Dr. Varney. Upon the demise of Dr. Varney he became associated as partner with Dr. Williams, and entered the Boston Dental College, now Tufts Dental School, from which institution he was graduated in 1898. He conducted an unusually successful and constantly growing dental practice, and enjoyed great popularity in his community. He was at one time president of the Vermont Dental Society, and gave clinics and read papers before many dental societies, notably the Northeastern Dental Association.

Deceased was married in 1898 to Miss Julia A. Oakes of Windsor, who, with one son, Edwin Oakes Burbridge, survives him.

"IN MEMORIAM" RESOLUTION.

Dr. G. V. Black.

THE following memorial resolution was adopted by the faculty of the Northwestern University Dental School on Thursday evening, September 23, 1915, at a special meeting convened to commemorate the life and services of Dean Greene Vardiman Black. The resolution was prepared and presented by Dr. Noyes and Dr. Gilmer, and was unanimously adopted by a rising vote:

The faculty and teaching staff of Northwestern University Dental School enter upon their records this memorial of their beloved dean, Greene Vardiman Black, M.D., D.D.S., Sc.D., LL.D., who died August 31, 1915, at the age of seventy-nine years.

Dr. Black was a teacher in dental schools for forty-five years, with an interruption of only three years, during which time he was the first president of the Illinois State Board of Dental Examiners, in which office he continued for four years more after he resumed teaching—1881–87. His first school work was as lecturer on pathology, histology, and operative dentistry in the Missouri Dental College, 1870–80. He was professor of dental pathology in the Chicago College of Dental Surgery, 1883–89. During this time, in 1887, he introduced the teaching of dental technics, by which the teaching of technical procedures in both operative and prosthetic dentistry are taught in laboratories, instead of depending, as previously, upon practical work in the clinic to acquire knowledge and skill in technical operations. This was an entirely new departure in dental teaching which was very soon adopted by most of the schools throughout the country, and finally by all of them. He was professor of dental pathology and bacteriology in the Dental Department of the University of Iowa, 1890–91. In the latter year he entered the faculty of this school as professor of dental pathology and bacteriology till 1897, when he became dean and professor of operative dentistry, dental pathology and bacteriology, and continued until his death.

The most important of Dr. Black's books are the chapters he wrote for the "American System of Dentistry," "The Periosteum and Peridental Membrane," the "Dental Anatomy," the "Operative Dentistry," and the "Special Dental Pathology."

His nature was simple, sincere, and approachable, and everyone who showed an interest in dental matters received a cordial welcome, and always found him ready to impart knowledge. He was a friendly man and attracted everyone who came within the sphere of his influence. The greatest desire and ambition of his life was to improve the standards and methods of dental education.

While in practice he was a very exceptionally wise and skilful operator, and throughout his long life he was a hard student, a successful investigator and inventor, and probably the most useful and the most influential man in the dental profession.

It would be interesting to tell of Dr. Black's studies and investigations that did not relate to dentistry. Two may be mentioned. He at one time made a study of the rings of annual growth in tree-stumps to find out which were the wet and which the dry seasons, recorded in the varying thickness of the annual growth, and he found that his interpretations corresponded accurately with the recorded weather reports as far back as there were any such reports. At another time he worked out the life-history of thirty or forty varieties of house molds. He was a many-sided man, and could do an astonishing number of different things, and do them better than other men could do them.

The honor, admiration, and affection we all felt for him can be only feebly expressed.

We also desire to express to Mrs. Black, the devoted wife, our most sincere and deep-felt sympathy in her bereavement. While making full recognition of the services of her distinguished husband, we wish to express our belief that she was no small factor in his great achievements, and we desire to acknowledge at this time the sacrifices she made in aid of the success of his labors.

CHARLES R. E. KOCH, *Sec'y.*

DENTAL LEGISLATION.

ALABAMA DENTAL LAW.

AN ACT

TO DEFINE DENTISTRY; TO PROVIDE FOR THE REGULATION OF THE PRACTICE THEREOF; TO PROVIDE FOR THE EXAMINATION OF APPLICANTS TO PRACTICE DENTISTRY IN ALABAMA; TO PROVIDE FOR THE ISSUING OF LICENSE CERTIFICATES AND THE REGISTRATION AND DISPLAY THEREOF; TO PROVIDE FOR REPORTS BY PROBATE JUDGES OF SAID REGISTRATIONS; TO PROVIDE FOR THE REVOKING OR REFUSING TO ISSUE SAID CERTIFICATES; TO PROVIDE A BOARD OF DENTAL EXAMINERS OF ALABAMA, PROVIDE FOR THEIR ELECTION AND PRESCRIBE THEIR DUTIES, POWERS, QUALIFICATIONS, TERMS OF OFFICE AND COMPENSATION; TO PROVIDE FOR THE DISPOSITION OF FEES COLLECTED BY SAID BOARD; TO PROVIDE FEES AND FUNDS FOR ENFORCING SAID ACT; TO PROVIDE FOR ENFORCING SAID ACT; TO ALLOW THE BOARD OF DENTAL EXAMINERS OF ALABAMA TO ENTER INTO RECIPROCITY AGREEMENTS WITH LIKE BOARDS OF OTHER STATES; TO PROVIDE PENALTIES AND PUNISHMENT FOR THE VIOLATION OF THE PROVISIONS OF SAID ACT; TO PROVIDE FOR ANY UNCONSTITUTIONALITY OF SAID ACT, AND TO REPEAL ALL GENERAL AND LOCAL LAWS IN CONFLICT WITH SAID ACT.

Be it enacted by the Legislature of Alabama, as follows:

1. (*A*) That recognizing that dentistry is a specialty of medicine and surgery, therefore after the passage of this act any person shall be said to be practicing dentistry within the meaning of this act who uses the words "Dentist," "Dental Surgeon," the letters "D.D.S.," or other letters or title in connection with his or her name which in any way represents him or her as engaged in the practice of dentistry, or shall advertise or permit to be advertised by sign, card, circular, handbill, newspaper, or otherwise, that he or she can or will attempt to perform operations of any kind, or shall diagnose, or treat, or profess to treat, any of the diseases or lesions of the oral cavity, teeth, gums, maxillary bones, or shall extract teeth, or shall prepare to fill cavities in human teeth, or shall correct malposition of the teeth or jaws, or shall supply artificial teeth, or shall administer anesthetics, general or local, administer or prescribe such remedies, medicinal or otherwise, as shall be needed in the treatment of dental and oral diseases, or do any practice included in the curricula of recognized, reputable dental colleges; *provided*, that nothing in this act shall interfere with the extraction of teeth without compensation, or the performance of mechanical work on inanimate objects only, by any person employed in or operating a dental laboratory, *and provided*, that this act shall not prevent students from performing dental operations under the supervision of competent instructors within a dental school or college, or the dental department of a university or college, recognized by the Board of Dental Examiners of Alabama, or from working under a preceptor during college vacation, only and under such rules and regulations as the Board of Dental Examiners of Alabama may prescribe.

(*B*) It shall be unlawful for any person to engage in the practice of this specialty, as either assistant or employee, or to receive any license required by law to practice this specialty, except he shall have passed the examinations provided for by this act, and received the certificates, as herein provided, and any person practicing this specialty in this State without having received a certificate, as herein provided, shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than one hundred dollars ($100) nor more than two hundred and fifty dollars ($250) for the first offense, and for the second offense a fine of not less than five hundred dollars ($500) or imprisonment of from one to six months in jail, or both, in the discretion of the court.

(*C*) It shall be unlawful for any officer either State, county, or municipal, to issue any license to practice this specialty to any person who does not show a certificate from the Board of Dental Examiners of Alabama; *provided*, however, that nothing in this act

shall be construed to prevent the extraction of teeth for compensation by legal practitioners of medicine.

2. That all persons now registered or licensed as dentists under the laws of the State of Alabama shall be entitled to continue in the practice of said profession unmolested by the provisions of this act.

3. Any person who shall hereafter desire a certificate to practice dentistry in this State shall file, or cause to be filed, with the secretary-treasurer of the Board of Dental Examiners of Alabama an application in writing, in such form as may be required by said board of dental examiners, and under oath, setting forth the name and age of the applicant, the school or college from which he or she graduated; and shall appear at such time and place as may be designated by the said board of dental examiners and submit to an examination, both practical and theoretical, as to his or her qualifications for registration as a licensed dentist.

4. No person shall be registered as a dentist under the provisions of this act who is not twenty-one years of age, and of good moral character; nor until he or she shall present to the said Board of Dental Examiners of Alabama satisfactory evidence that he or she has graduated in dentistry, and shall pass a satisfactory examination before said Board of Dental Examiners of Alabama, which board shall have full power to determine what constitutes a reputable school or college of dentistry.

5. That if, upon examination and investigation, said Board of Dental Examiners of Alabama shall determine that the applicant possesses the necessary qualifications as to character and education as herein provided, they shall enroll his or her name upon a register to be kept by said board for the purpose, and issue to him or her a certificate, which said certificate, when recorded as herein provided for, shall entitle such person to practice dentistry in the State of Alabama.

6. That on and after the passage of this act it shall be unlawful for said Board of Dental Examiners of Alabama to grant a temporary certificate or permit, to practice dentistry or any of its branches, to any person, except that a person coming into this State at a time between the regular meetings of the board, who holds a permanent license or certificate as a dentist granted by any board of dental examiners within the United States, may be granted a permit to practice during the interim between the time of making application for a certificate and the time of the next meeting of the said board of dental examiners; *provided* that he or she shall have been a legal practitioner for five years in the State from which he or she comes, and provided he or she shall be recommended by the president and secretary of the board of dental examiners and the president and secretary of the dental association of the State from which he or she comes, and the board shall require from said applicant a fee of twenty-five dollars ($25) for such temporary permit.

7. That the certificate herein provided for must be signed by the president of the Board of Dental Examiners of Alabama and countersigned by the secretary-treasurer of said board, and must within thirty days after the granting thereof be filed and recorded in the office of the judge of probate of some county in the State, and shall be so filed in each county in which he or she shall practice or offer to practice, and after the same has been recorded, the judge of probate shall indorse thereon, and certify under the seal of the court the fact of its record, and the time of its filing, and for which he is entitled to a fee of one dollar; *provided* that on the first day of October after this act takes effect, or within ten days thereafter, the probate judge of each county shall furnish the Board of Dental Examiners of Alabama, on blanks to be furnished by said board, a list of all licenses or certificates to practice dentistry registered therein; and shall annually thereafter on the first of October, or within ten days thereafter, furnish to said board a like list of all licenses or certificates registered since the last previous annual report.

8. That such license or certificate so recorded and certified shall be evidence of authority of the person therein named to practice dentistry.

9. The board of dental examiners may refuse to issue certificate or suspend or revoke the same for any of the following causes: 1. The presentation to the board of any diploma, license, or certificate illegally or fraudulently obtained, or one obtained from an institution which is not reputable, or an unrecognized or irregular institution or state board, or the practice of any fraud or deception. 2. The commission of a criminal operation, or chronic and persistent inebriety or addiction to drugs to such extent as to render him unsafe or unreliable as a practitioner, or being guilty of gross immorality that would tend to bring reproach upon the dental profession of the State, or if the person holding such certificate shall advertise to practice without causing pain, or shall in any other manner advertise with a view of deceiving or de-

frauding the public, or advertise to use any drug, nostrum, patent or other proprietary drug or medicine of any unknown formula, or be guilty of any grossly unprofessional conduct likely to defraud or deceive the public, or which disqualifies the applicant or holder to practice with safety to the people, or who employs directly or indirectly any unregistered or unlicensed person to practice dentistry in his or her office. In all proceedings for a suspension or revocation of certificate or license, the holder thereof shall be given thirty days' notice to prepare for a hearing, and he shall be heard in person, or by counsel, or by both. All members of the board of dental examiners, separately and severally, shall have the power to administer oaths, in the hearing of all matters arising in the course of their duties, and in such trials as are herein referred to. The Board of Dental Examiners of Alabama may take oral or written proofs for or against the complainant as it may deem will best present the facts. And for the purpose of such hearing the Board of Dental Examiners of Alabama are hereby empowered and authorized to require the attendance of witnesses, administer oaths, and hear testimony, either oral or documentary, for and against the accused. In all cases of suspension or revocation of certificates as herein provided for, the holder may appeal to the circuit court, or other court of like jurisdiction, in the county in which the person whose certificate is ordered revoked resides.

10. That any certificate to practice dentistry obtained through fraud, or by any false or fraudulent representations or practice, shall be void; and every person who shall procure or attempt to procure, by false or fraudulent representations, such certificate, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be fined not less than fifty dollars nor more than three hundred dollars, or by imprisonment of not less than one nor more than six months, or both.

11. That said board of dental examiners shall consist of five persons, who shall be members in good standing of the Alabama Dental Association, and not connected with or interested in any dental college or school, or dental supply business, and must have practiced dentistry in this State for a period of not less than three years. Within fifteen days after the approval of this act the president of the Alabama Dental Association shall appoint a board of dental examiners, who shall hold office until the next annual meeting of the Alabama Dental Association. The Alabama Dental Association shall, at their next annual meeting elect from their membership five members, to wit: one for one year, one for two years, one for three years, one for four years, and one for five years, and thereafter the Alabama Dental Association shall elect annually one member of said board from its membership for a term of five years, *provided* that no elected member of said board shall succeed himself as a member thereof, except those elected or appointed for a period of less than five years may succeed themselves if elected; *provided further* that this act shall not be construed so as to prevent the election to the board of a member who may have previously served as a member thereof. The board of dental examiners appointed under this act shall within thirty days after their appointment hold an examination for certificates to practice dentistry or dental surgery in this State. That said board of dental examiners shall organize annually by the election of a president and secretary-treasurer. Vacancies on said board of dental examiners shall be filled by appointment by the president of the Alabama Dental Association, and such appointee shall hold office from the time of his appointment until the next annual meeting of the Alabama Dental Association, when his successor shall be elected to fill the unexpired term, *provided* that the term of office of a member elected to said board shall begin on the first day of August in the year in which he was elected. Each member of said board shall submit his questions to the other members of said board, and they shall decide on each question as to whether or not it is fair and practical. Members of said board may be removed from office at any time by the Alabama Dental Association for a cause which the majority of those members present may deem sufficient. Upon the failure of any member of said board to attend a meeting thereof, the members of said board present may appoint a substitute to temporarily fill the vacancy for that meeting, and for the continued failure or inability of a member of said board to attend two consecutive regular meetings thereof, the board may declare a vacancy.

12. That the board shall furnish each applicant with official examination blank paper, of uniform size, which size shall not vary but be kept uniform from year to year, and such official paper shall be paid for out of any funds received from fees paid by applicants. Before taking the examination each applicant shall register his name and post-office, with such other facts as the board may require, and each applicant shall be given a number under which he shall be examined,

which number shall appear on his papers, and his name shall not appear thereon. The date and place of the examination shall be indorsed on the register, which must be kept securely by the secretary of the board. That within ten days after the grading of papers, each member of the board shall forward all papers graded by him to the secretary, who shall, within thirty days after the examination has been completed, deposit the entire collection of examination papers, including questions and answers, with a separate list of the names of those taking each examination, and the numbers under which the examination was taken, with the Alabama State Department of Archives and History. The examination papers so filed shall be preserved for five years, and shall at all reasonable office hours be open to examination by any citizens of this State.

13. That it shall be the duty of each member of said board, after his election or appointment, and before entering upon the discharge of the duties of his office, to file with the secretary-treasurer of said board an oath to properly and faithfully discharge the duties of his office, which oath may be taken before any officer authorized to administer oaths in this State.

14. That annually, said Board of Dental Examiners of Alabama shall organize by the election of a president and secretary-treasurer, each of whom shall be members of said board, and shall hold their respective offices for a term of one year, and until their successors are elected and qualified; that the secretary-treasurer shall give bond in such sum as may be prescribed by said board, conditioned to discharge the duties of said office according to law, which bond shall be made payable to the said Board of Dental Examiners of Alabama and approved by the president of said board. The said board shall hold an annual meeting at such time and place as they may designate for the examination of applicants for certificates and for the discharge of all such other business as may legally come before them; and may hold such additional meetings, on the call of the president of said board, and the president shall call such meeting on petition of a majority of the members of said board, as may be necessary for the examination of applicants for certificates, or for carrying into effect the provisions of this act; and at these meetings said board may transact any and all business that may legally come before them.

15. Said Board of Dental Examiners of Alabama shall have a common seal, and shall have the power and authority to adopt such rules, by-laws, and regulations, not inconsistent with the laws of this State, as may be necessary for the regulation of its proceedings, and for the discharge of the duties imposed upon it; and shall have power and authority to employ counsel to assist in the enforcement of the provisions of this act, and for such other purposes as may be deemed necessary by the said board. Said board shall keep a true and correct record of its proceedings and a register of all persons to whom certificates have been issued; and the books and register of said board, or a copy of any part thereof, duly certified by the secretary-treasurer of said board under seal, shall be received as evidence of the matters and things therein recorded and so certified in all courts of this State. A majority of said board shall constitute a quorum for the transaction of all business; and the members of said board shall have power and authority to administer oaths in all matters pertaining to the discharge of the duties imposed upon them under this act.

16. The secretary-treasurer of said Board of Dental Examiners of Alabama shall receive such salary as may be prescribed by said board and his necessary expenses while engaged in the performance of his official duties; and each of the other members of said board shall receive the sum of five dollars ($5.00) for each day actually employed in the discharge of their official duties and necessary expenses while so engaged. All fees collected by said board, or by the secretary-treasurer thereof, shall be placed to the credit of a fund which is hereby appropriated solely for the use of the said board of dental examiners in the execution and enforcement of the provisions of this act, and the payments of the salaries, expenses, and other costs herein provided for; said moneys to be paid out upon warrants drawn by the secretary-treasurer and countersigned by the president of said board; *provided*, that no part of said expense shall be paid out of the State treasury. The secretary-treasurer shall transact all *ad interim* business for the said board unless otherwise specified in this act.

17. In order to provide the means for carrying out and enforcing the provisions of this act, the said Board of Dental Examiners of Alabama shall charge each person applying to it for examination for a certificate to practice dentistry or dental surgery in this State, an examination fee of twenty dollars, and in addition thereto a license fee of five dollars, for every license or duplicate license issued by said board. Should an applicant for certificate fail to pass a satisfactory

examination, he or she may take a re-examination at the next regular annual meeting of the said board, at which time he or she shall be exempt from the payment of the examination fee; *provided*, this exemption shall not be construed to apply except at the next regular annual meeting of said board.

18. It shall be the duty of said Board of Dental Examiners of Alabama to investigate all charges of violation of this act, or any other laws of this State regulating the practice of dentistry, brought to their knowledge; and wherever there has been a violation of said laws, or when advised by any legal member of the profession that there has been a violation of the provisions of this act, or any of them, it shall be the duty of said board through its secretary-treasurer to report such violations to the circuit or county solicitor, or other prosecuting officer of the county in which such violation is alleged to have occurred, whose duty it shall be to prosecute for all violations of this act.

19. It shall be unlawful for any person or persons to practice or offer to practice dentistry or dental surgery under, or use the name of any company, association, corporation or business name, or under any name except his or her name; or to operate, manage, or be employed in any room or rooms, or office, where dental work is done, or contracted for, that is operated under the name of any company, association, trade name, or corporation. Any person or persons practicing or offering to practice dentistry or dental surgery, shall practice under and use his or her name or their names, only.

20. The certificate to practice dentistry herein provided shall at all times be displayed in a conspicuous place in his or her office wherein he or she practices the profession of dentistry, and he or she shall, whenever requested, exhibit such certificate to any of the members of the Board of Dental Examiners of Alabama or its authorized agent.

21. The Board of Dental Examiners of Alabama may in its discretion issue a certificate to practice dentistry without examination, other than clinical, to a legal and ethical practitioner of dentistry who removes to Alabama from another State or Territory of the United States whose standard of requirement is equal to that of Alabama, and in which he or she has conducted a legal and ethical practice of dentistry for at least five years immediately preceding his or her removal, *provided* such applicant shall present a certificate from the dental board or a like board of the State or Territory from which he or she removes, certifying that he or she is a legal, competent, and ethical dentist, and of good moral character; and *provided further*, that such certificate is presented to the Board of Dental Examiners of Alabama within six months from the date of its issue, and that the board of such other State or Territory shall permit in like manner by law the recognition of certificates issued by the Board of Dental Examiners of Alabama when presented to such other board by legal practitioners of dentistry from this State who may wish to remove to a practice in such State or Territory.

22. Any person who is a legal, ethical, and competent practitioner of dentistry in the State of Alabama, and of good moral character, and known to the Board of Dental Examiners of Alabama as such, who shall desire to change his or her residence to another State or Territory, or foreign country, shall upon application to the said Board of Dental Examiners of Alabama, receive a special certificate over the signature of the president and secretary-treasurer of said board and bearing its seal, which shall attest the facts above mentioned in section 20 and give the data upon which he or she was registered and licensed.

23. The fee for issuing a certificate to a legal practitioner from another State, as provided in section 20, shall be twenty-five dollars ($25.00), and the fee for issuing a certificate to the legal practitioner in this State as provided in section 21 shall be five dollars ($5.00), and in each case the fee shall be paid in cash before the certificate shall be issued.

24. The secretary-treasurer of said Board of Dental Examiners of Alabama shall make an annual report to the Alabama Dental Association, containing an itemized statement of all moneys received and disbursed, and a summary of its official acts during the preceding year.

25. Any person violating any of the provisions of this act, not herein specifically provided for, shall be deemed guilty of a misdemeanor, and upon conviction shall be fined not less than fifty dollars nor more than five hundred dollars.

26. That the Board of Dental Examiners of Alabama provided for by this act shall have the power and authority to transact all business left unfinished by the board superseded by the said board provided by this act, including the payment of all outstanding obligations.

27. If any section, or portion thereof, or any provision of this act, should be found

and held to be unconstitutional, that fact shall not have the effect of rendering invalid or inoperative any other portion or provision of this act which is not of itself and in itself unconstitutional.

28. All laws and parts of laws, general, special, and local, in conflict with the provisions of this act are hereby expressly repealed.

Approved August 31, 1915.

SOCIETY NOTES AND ANNOUNCEMENTS.

OHIO STATE DENTAL SOCIETY.

Semi-centennial Meeting and Dedication of the Miller Memorial,

AT COLUMBUS, DECEMBER 7, 8, 9, AND 10, 1915.

Partial Program.

Historical Address by the President, Dr. E. C. Mills.

Dr. Hermann Prinz, "On Causes Concerning Susceptibility and Immunity to Dental Caries."

Dr. Geo. H. Wilson, "Some Problems in Mounting Full Artificial Dentures."

Dr. Chas. C. Voelker, "The Place of Silicate Cements in Dentistry."

Dr. Geo. E. Johnson, "How to Read X-Ray Films."

Dr. J. H. J. Upham, "Pyorrhea Alveolaris from a Medical Viewpoint."

Fifteen-minute practical papers:

Dr. W. O. Hulick, "Are Crowns and Bridges a Menace to Health?"

Dr. J. P. Henahan, "Conductive Anesthesia in the General Practice of Dentistry."

Dr. C. K. Teter, "Management of Difficult Extractions."

Dr. H. V. Cottrell, "Accessories to Articulation."

Dr. Gillette Hayden, "Differentiation Between Average Tooth-cleaning and Prophylaxis."

Dr. L. E. Custer. (Subject to be announced.)

Explanation of the Harrison Narcotic Law by the Deputy Collector of Internal Revenue.

Dr. E. C. Kirk will deliver the principal address at the Dedication of the Miller Memorial Statue on Wednesday afternoon, followed by Drs. T. P. Hinman, T. W. Brophy, N. S. Hoff, and others.

Thursday morning will be devoted to the presentation of a number of illustrated descriptive clinics before the entire society, and Friday morning to a large number of general chair and table clinics.

On Wednesday evening a banquet will be served for our guests and members.

It is the expectation that this meeting will set a new high mark in our State Society gatherings. Dr. Hinman, president, and Dr. King, general secretary, of the National Dental Association will be present, and members of all other state societies will be given a cordial welcome.

In view of the features of especial interest we hope to have representatives from every state, inasmuch as nearly every state contributed to the Miller Memorial.

Please note the four days' session, and be assured of a hearty welcome and a good time.

F. R. CHAPMAN, *Sec'y*,
305 Schultz Bldg., Columbus, O.

VIRGINIA STATE DENTAL ASSOCIATION.

THE forty-sixth annual convention of the Virginia State Dental Association will be held in Richmond, on November 4, 5, and 6, 1915.

Jefferson Hotel will be headquarters. This hotel is one of the handsomest in the South. There is abundant room for exhibits.

Exhibitors can communicate with Dr. R. C. Walden of Richmond, who is chairman of the Committee on Exhibits. Dr. J. A. C. Hoggan of Richmond is chairman of the Entertainment Committee, and will gladly have accommodations reserved for guests.

GEO. F. KEESEE, *Sec'y*,
200 E. Franklin st., Richmond, Va.

FIFTH, SIXTH, SEVENTH, AND EIGHTH DISTRICT DENTAL SOCIETIES (N. Y.)

A UNION meeting of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York will be held at the Onondaga Hotel, Syracuse, November 11, 12, and 13, 1915. This is to be the big meeting of the year.

B. T. MASON, *Sec'y*,
Fulton, N. Y.

IOWA STATE DENTAL SOCIETY,

Northwestern District.

THE Northwestern District of the Iowa State Dental Society will hold its annual Clinic and Manufacturers' Exhibit in the Martin Hotel, Sioux City, November 23 and 24, 1915.

C. E. WESTWOOD, *Sec'y*.

ILLINOIS BOARD OF EXAMINERS.

THE next examination by the Illinois State Board of Dental Examiners will be held at the Illinois College of Dentistry, Chicago, Ill., commencing November 8, 1915, at 9 A.M. For application blank and further information address

O. H. SEIFERT, *Sec'y*,
Springfield, Ill.

INDIANA BOARD OF EXAMINERS.

THE next meeting of the Indiana State Board of Dental Examiners will be held at the State-house, Indianapolis, Ind., commencing November 8th, and continuing for five or six days.

For application blanks and full particulars, address

FRED J. PROW, *Sec'y*,
Bloomington, Ind.

MARYLAND BOARD OF EXAMINERS.

THE Maryland Board of Dental Examiners will meet for examination of candidates for certificates on November 4 and 5, 1915, at the Baltimore College of Dental Surgery, Baltimore, at 9 A.M. For application blanks and further information apply to

F. F. DREW, *Sec'y*,
701 N. Howard st., Baltimore, Md.

MASSACHUSETTS BOARD OF REGISTRATION.

THERE will be a meeting of the Massachusetts Board of Dental Examiners for the examination of candidates November 16, 17, 18, and 19, 1915. Information and application blanks furnished upon application to

G. E. MITCHELL, *Sec'y*,
Haverhill, Mass.

DENTAL COMMISSIONERS OF CONNECTICUT.

THE Dental Commissioners of Connecticut hereby give notice that they will meet at Hartford, on Thursday, Friday and Saturday, November 18, 19, and 20, 1915, to examine applicants for license to practice dentistry, and for the purpose of transacting any other business proper to come before them. Application blanks, etc., will be mailed by the Recorder upon request.

By order of the Commission.

EDWARD EBERLE, *Recorder*,
902 Main st., Hartford, Conn.

IOWA BOARD OF EXAMINERS.

THE next meeting of the Iowa State Board of Dental Examiners will be held at Iowa City, Iowa, commencing Monday at 9 A.M., December 6, 1915.

For full information and application blanks apply to

J. A. WEST, *Sec'y*,
417* Utica Bldg., Des Moines, Iowa.

PENNSYLVANIA BOARD OF EXAMINERS.

THE next regular meeting of the Pennsylvania Board of Dental Examiners, for the examination of applicants who desire to register in this state, will be held in Musical Fund Hall, Philadelphia, and the University of Pittsburgh, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, December 15, 16, 17, and 18, 1915. Application blanks can be secured from the Department of Public Instruction, Harrisburg.

The board desires to call attention to the resolution adopted recently by the Dental Council requiring that matriculates in a dental college in 1915 shall have the equivalent of a four years' high-school diploma at the time of their matriculation, in order to

be eligible for examination by the Pennsylvania Board.

The amendments to the dental law passed by the last session of the Pennsylvania Legislature makes it necessary for every dentist engaged in the practice of dentistry in this state to register with the secretary of the Board of Dental Examiners before January 1, 1916, and annually thereafter, at one dollar per year. Blanks are being prepared and will be sent out as soon as possible. Anyone not receiving the blanks can secure them from

ALEXANDER H. REYNOLDS, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

CALIFORNIA BOARD OF EXAMINERS.

THE next examination of applicants for a license to practice dentistry in the State of California will be held in the city of San Francisco, beginning on December 9, 1915. All applications must be accompanied by (1) the fee of $25.00; (2) necessary credentials—diploma and license from other states; (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

Testimonials of good moral character for applicants who are licensed in some other state of the United States must bear the signature and seal of the secretary of the Board of Dental Examiners or the secretary of the State Dental Association of that state. For further particulars address

C. A. HERRICK, *Sec'y*,
133 Geary st., San Francisco, Cal.

NEW JERSEY BOARD OF REGISTRATION.

THE State Board of Registration and Examination in Dentistry of New Jersey will hold their semi-annual meeting and examination in the Assembly chamber at the Statehouse, Trenton, N. J., December 6, 7, 8, and 9, 1915. License fee $25. Re-examination fee $10.

The following practical tests will be required: Insertion of an approximal gold filling, compound approximal amalgam filling, and a silicate filling, besides a practical test of the applicant's ability in oral prophylaxis; also preparation of a cavity for an inlay with wax pattern. Prosthetic dentistry: Five-piece bridge and Richmond crown in addition to an anatomical articulation of a full upper and lower set of teeth. Teeth to be furnished by applicant. Wax bites properly trimmed and in place on models for inspection before setting up teeth.

Attention is directed to the following requirement: "All applicants for a license to practice dentistry in New Jersey shall present to said board a certificate from the superintendent of public instruction showing that before entering a dental college he or she had obtained an academic education, consisting of a four years' course of study in an approved public or private high school, or the equivalent thereof." In accordance with the law, the secretary will issue application blanks only upon presentation of the required certificate from the superintendent of public instruction, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to the acting secretary,

JOHN C. FORSYTH,
430 East State st., Trenton, N. J.

TEXAS BOARD OF EXAMINERS.

THE next regular meeting of the Texas State Board of Dental Examiners will be held at the Adolphus Hotel, Dallas, Texas, beginning Monday morning at 9 o'clock, December 13, 1915.

All applications, accompanied by the fee of $25, should be in the hands of the secretary not later than December 8th. Official application blanks will be sent upon request. For further information address

C. M. MCCAULEY, *Sec'y*,
840 Wilson Bldg., Dallas, Texas.

DISTRICT OF COLUMBIA BOARD OF EXAMINERS.

THE next examination of applicants for license to practice in the District of Columbia will be held at the George Washington University, January 3, 4, 5, and 6, 1916. Applications should be in the hands of the secretary two weeks before the date of examination. Fee $10.

STARR PARSONS, *Sec'y*,
1309 L st., N. W., Washington, D. C.

MONTANA BOARD OF EXAMINERS.

The Montana State Board of Dental Examiners will hold a session for examination on January 10, 11, 12, and 13, 1916.

G. A. Chevigny, *Sec'y*,
Butte, Mont.

NORTH CAROLINA BOARD OF EXAMINERS.

The next meeting of the North Carolina State Board of Dental Examiners will be held at Salisbury, N. C., beginning promptly at 9 o'clock on Thursday, January 13, 1916. For further information and application blanks address

F. L. Hunt, *Sec'y*,
Asheville, N. C.

ARMY DENTAL SURGEONS.

Memoranda of Changes.

For the week ending Friday, September 17th:

Acting Dental Surgeon Harry E. Kimble will proceed to Harlingen, Tex., and report in person to the commanding officer of Field Hospital No. 5 for duty with that organization.

Leave of absence for one month, to take effect upon his relief from duty at Fort Leavenworth, Kans., is granted First Lieut. Hugh G. Voorhies.

For the week ending Saturday, October 2d:

Acting Dental Surgeon J. H. Hess will proceed from Fort Douglas, Utah, after October 23, 1915, to Fort George Wright, Wash., for temporary duty.

Acting Dental Surgeon Robert H. Mills is relieved from duty at Fort Riley, Kans., to take effect upon the completion of his duty as a member of the board appointed to meet at Fort Logan, Colo., in paragraph 44, S. O. Orders No. 222, September 23, 1915, War Department, and will then proceed to Fort Robinson, Nebr., and report in person to the commanding officer of that post for duty and by letter to the commanding officer, Central Department.

EXAMINATION OF DENTISTS FOR THE U. S. NAVY.

Information received from Surgeon-general of the Navy W. C. Braisted states that the next examination for the appointment of acting dental surgeons in the navy will be held at Washington, D. C., on November 29, 1915. At the present time there are two vacancies.

Application should be made to the Chief of the Bureau of Navigation, via the Surgeon-general, U. S. Navy.

A circular supplying "Information for Persons Desiring to Enter the Dental Corps of the United States Navy," and containing the form of application and all particulars pertaining to the corps, may be obtained on application to the Surgeon-general, U. S. Navy, Washington, D. C.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING SEPTEMBER 1915.

September 7.

No. 1,152,711, to Francis M. Dean. Matrix-retainer.

No. 1,152,825, to Isaac W. Litchfield. Dental floss-holder.

No. 1,152,964, to Wilhelm Nielsen. Manufacture of dental models.

September 14.

No. 1,153,801, to Russell Lewis Long. Tooth-brush.

September 28.

No. 1,154,942, to George B. Snow. Dental face-bow.

No. 1,155,020, to Leander Van Orden. Saliva-ejector.

THE

DENTAL COSMOS.

VOL. LVII. DECEMBER 1915. No. 12.

ORIGINAL COMMUNICATIONS.

A RATIONAL APPLIANCE FOR THE CORRECTION OF PALATAL DEFECTS, BASED ON ORIGINAL STUDIES OF THE ACTION OF THE MUSCLES OF THE SOFT PALATE.

By W. H. O. MCGEHEE, D.D.S., M.D., Cincinnati, Ohio,
PROFESSOR OF OPERATIVE AND PROSTHETIC DENTISTRY, AND SUPERINTENDENT OF CLINICS IN THE OHIO COLLEGE OF DENTAL SURGERY.

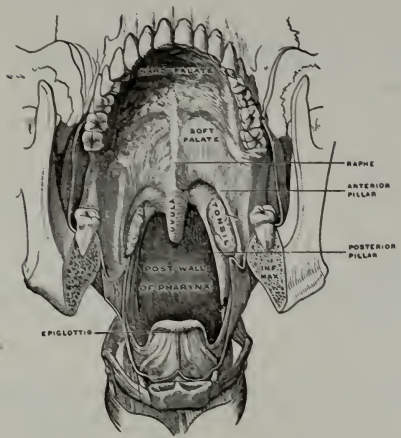
(Read before the New Jersey State Dental Society, at its annual meeting, Asbury Park, July 22, 1915.)

ALL appliances for the correction of palatal defects heretofore presented to the profession and used by specialists in this field of work have been constructed on empirical lines and after immature and imperfect studies of the action of the muscles of the soft palate. It is surprising, after reading a description of these muscles in such standard works on anatomy as those of Gray, Piersol, Cunningham, Broomell, and others, and after hearing what remarkable claims have been made for the appliances advocated, how little has really been known of the true action of the muscles concerned, of the real needs of an effective appliance, and the shortcomings of the instruments devised for closing the cleft in these cases.

The misconceptions of the action of the muscles of the soft palate, or what remains of them when a cleft presents, and the defects of appliances used for closing the cleft, were first called to the attention of the writer five or six years ago by Dr. D. D. Cornell, who was then professor of prosthetic dentistry in the Ohio College of Dental Surgery. Dr. Cornell at that time constructed appliances for several cases in our clinics, which were made after a clinical study of the movements of the tissues bounding the cleft in these cases, with the result that marked improvement was made in the conditions obtained in correcting the defects. This was never reported to the profession. Since that time I have been engaged in a further study of the action of the palatal muscles, and in the perfecting of an appliance based on a rational conception of the needs of an instrument of this character, with the result that many improvements have been made on the in-

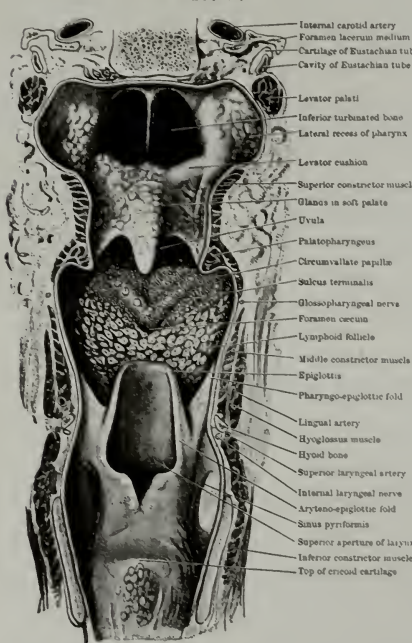
instrument as first designed by Professor Cornell. In presenting this appliance to the profession I wish to extend my thanks to Dr. Cornell, to Dr. M. L. Bayliss, to whom I am indebted for the working out of numerous mechanical details incident to the construction and perfecting of the appliance, and to Dr. Hugh W. MacMillan and Dr. E. L. Everley for valuable assistance in the anatomical studies of the action of the muscles concerned.

FIG. 1.



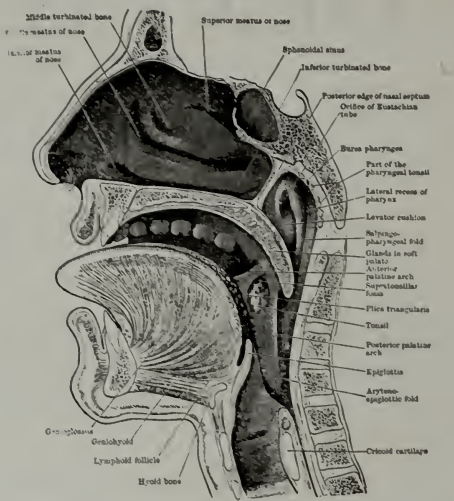
Antero-inferior surface of the soft palate. The tongue has been removed, so that the pharyngeal isthmus is distinctly seen. (Luschka.)

FIG. 2.



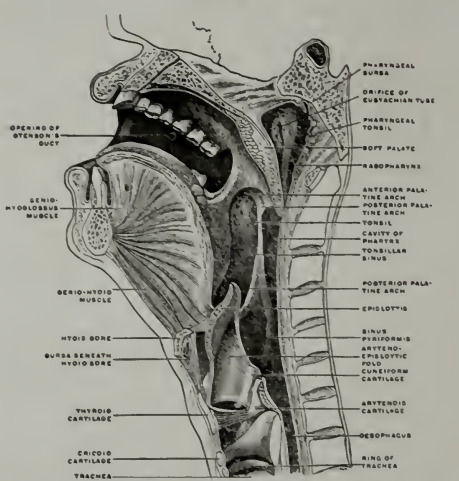
Anterior wall of the pharynx with its orifices, seen from behind. Cunningham.)

FIG. 3.



Sagittal section through mouth, tongue, larynx, pharynx, and nasal cavity. (Cunningham.)

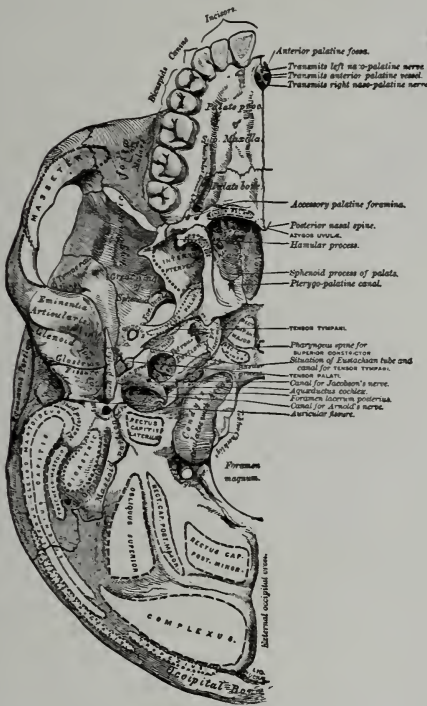
FIG. 4.



Sectional view of the mouth, pharynx, etc. (Gray.)

The soft palate and uvula constitute a muscular curtain or fold, covered on its upper and lower sides by mucous membrane, projecting backward and downward into the pharynx. They form the posterior portion of the floor of the nasal cavity and the roof of the mouth. Figs. 1, 2, 3, and 4 afford excellent opportunities for studying their form, position, and relationships.

FIG. 5.



Base of the skull—external surface. (Gray.)

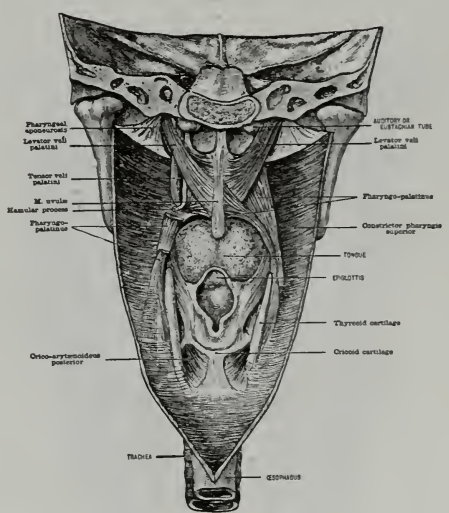
The muscles of the soft palate consist of five pairs, as follows, viz, the tensor palati (tensor veli palatini), levator palati (levator veli palatini), azygos uvulæ (M. uvulæ), palato-glossus (glosso-palatinus), and palato-pharyngeus (pharyngo-palatinus). A study of the origin, insertion, and action of these muscles, as described in all of the standard works on anatomy, fails to bring out some very important facts bearing directly on the subject in hand—facts which have not heretofore been brought to the attention of workers in this field, and which will presently be mentioned.

STUDY OF THE MUSCLES OF THE SOFT PALATE.

(1) TENSOR PALATI.

Origin: This muscle originates from the scaphoid fossa at the root of the pterygoid plate, the spinous process of the sphenoid bone, and the side of the Eustachian tube. (See Fig. 5.) It

FIG. 6.



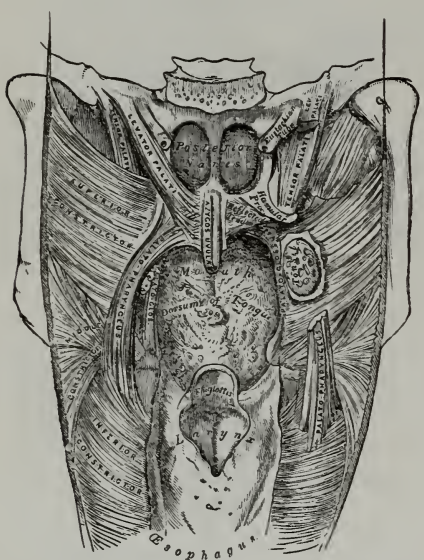
View of muscles of soft palate, as seen from within the pharynx. (Morris, modified from Bourgery.)

passes downward and forward, and then, in the form of a tendon, hooks around the hamular process of the sphenoid bone, where it spreads out like a fan to be inserted into the full length of the aponeurosis of the soft palate and into the transverse ridge on the lower surface of the palate bone. *Action:* It renders the palate tense, and owing to its fan-like insertion pulls the posterior part upward and forward. It also opens the Eustachian tube. In cases of cleft palate it would tend to pull the borders of the cleft upward, forward, and outward, thus further widening the cleft.

(II) LEVATOR PALATI.

Origin: It originates from the lower surface of the petrous portion of the temporal bone (see Figs. 5, 6, and 7) and the cartilaginous Eustachian tube. *Insertion:* It passes downward, forward, and inward with the Eustachian tube, leaves it, and expands into a layer which spreads out into the soft palate. Some of the anterior fibers from the tube go to the back of the hard palate, forming the *salpingo-palatinus,* while others descend into the lateral wall of the pharynx, covered by mucous membrane, beneath the salpingo-pharyngeal fold. The great body of the fibers cross the middle line in the front part of the soft palate, most of them descending in the opposite side, and uniting with fibers from the fellow muscle. *Action:* It pulls the soft palate upward and backward, and also helps to render it tense. In cleft palate cases, it would also tend to widen the cleft.

FIG. 7.



Muscles of the soft palate, the pharynx being laid open from behind. (Gray.)

(III) AZYGOS UVULÆ.

Origin: This pair of muscles, lying in close apposition, originates from the tendinous fibers of the tensor palati and from the posterior nasal spine of the palate bone. (See Fig. 5.) They pass backward and downward through the center of the soft palate (see Figs. 6 and 7), to be inserted into the uvula. *Action:* They pull the uvula and soft palate upward and forward.

(IV) PALATO-GLOSSUS.

Origin: This muscle, with its fellow of the opposite side, forms the anterior pillar of the fauces. (See Figs. 1, 3, 4 and 7.) It originates from the inferior surface of the soft palate near the base of the uvula. It passes downward and forward, and is inserted into the base of the tongue. *Action:* It draws the soft palate downward and forward, and pulls the tongue upward and backward.

(V) PALATO-PHARYNGEUS.

Origin: It originates in the substance of the soft palate in two distinct layers: (1) The thin posterior-superior layer continues across the median line and unites with its fellow of the opposite side, while (2) the antero-inferior layer, much thicker, is also attached to the posterior border of the hard palate. The levator palati and azygos uvulæ are inclosed between these two layers, which unite at the posterior edge of the palate and here receive additional fibers originating from the Eustachian tube and sometimes described as the *salpingo-pharyngeus.* The muscle passes downward and backward, forming the posterior pillar of the fauces (see Figs. 1, 3, 4, 6 and 7), the fibers then spreading out into a thin sheet in the wall of the pharynx, being anteriorly in continuity with the stylo-pharyngeus, and are inserted into the posterior border of the thyroid cartilage and the aponeurosis of the pharynx as far down as the inferior border of the inferior constrictor muscle. *Action:* It pulls the soft palate downward and backward, elevates the pharynx during deglutition, and opens the Eustachian tube.

Action of Muscles of Soft Palate in Cleft Palate.

Summarizing the action of these five pairs of muscles with special reference to their bearing on the subject in hand, it will now readily be seen that—

(I) The *tensor palati* draws the natural velum upward and forward, renders it tense, and in cases of cleft palate further widens the cleft.

(II) The *levator palati* pulls the soft palate upward and backward, renders it tense, and still further widens the cleft if one be present.

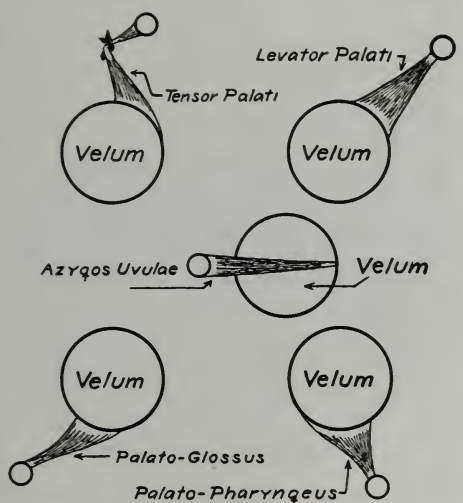
(III) The *azygos uvulæ* pulls the organ upward and forward.

(IV) The *palato-glossus* draws the palate downward and forward.

(V) The *palato-pharyngeus* pulls the palate downward and backward, renders the posterior portion tense, and in cases of cleft palate widens the posterior portion of the cleft. (See Figs. 8 and 9.) This being the case, it is now proved that the soft palate, instead of having only an upward and downward movement, as mentioned in text-books on anatomy, is really capable of four movements—that is to say, upward, downward, forward, and backward.

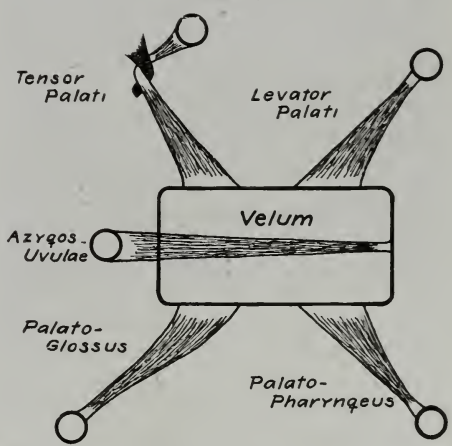
In cases of absence or loss of a portion of these tissues, the tensor action of the remains of the muscles mentioned and bounding the cleft would also still further widen the cleft. These facts have never been previously mentioned or understood by writers on this subject. Moreover, owing to the facts that the cleft is not always in the center and the remains of the tissues bounding the cleft are occasionally of unequal amount, there is frequently an uneven contraction or movement of these tissues during deglutition and speech, with the result that they will draw away, during the performance of these acts, from one or the other side of appliances as previously constructed, depending on which side of the cleft is capable of greater movement.

Fig. 8.



Diagrammatic drawing, showing action of the muscles of the soft palate.

Fig. 9.



Diagrammatic drawing showing action of the muscles of the soft palate.

Requirements of a Successful Obturator.

It is now readily seen that a successful obturator should be capable, not only of upward and downward movements, but, in order that it may remain in perfect adaptation to the boundaries of the cleft under all circumstances, should really possess six distinct movements, that is

to say, vertical (upward and downward), antero-posterior (forward and backward), and lateral (right and left). The appliance which I shall presently describe is designed with this idea in view, and is presented to the profession after adequate and successful trial in many clinical cases.

Action of the Constrictor Pharyngis Superior. Another muscle, which I have not mentioned, viz, the *constrictor pharyngis superior* (see Figs. 2, 6, and 7), is also undoubtedly intimately concerned in the movements of a properly constructed artificial substitute. The expansion and contraction of this muscle has the function of enlarging or diminishing the diameter of the upper portion of the pharynx and of pulling its posterior wall forward in contact with the posterior extremity of the soft palate, or of a properly constructed obturator (see Figs. 3 and 4), thus shutting off the nasal cavities during the formation of certain vowel and consonant sounds, and in the act of deglutition. An appliance which will admit of forward and backward movements will, undoubtedly, more perfectly adapt itself to the conditions created by the action of this muscle than one which is not capable of antero-posterior motion.

The New Cleft Palate Appliance, and a New Technique for Making It.

The appliance suggested consists of a metal or vulcanite plate with clasps, vulcanized or soldered into the heel of which is a clasp-metal extension, on which rests the hard-rubber obturator. From the center of the metal extension projects upward through the obturator a screw-cut gold post with a nut on its end. Vulcanized into the hollow portion of the obturator is a flexible clasp-metal tongue, through which the upright screw-post previously mentioned passes, and in contact with which it is held by means of the nut on its end. On the under surface of this metal tongue is a small gold hook, to which is attached one end of a spiral spring, the other end hooking around the upright screw-cut post. Another spiral spring extends from a similar hook, vulcanized into the posterior part of the upper hollow portion of the obturator, to the same upright post. The technique here described for obtaining the impressions and models, as well as for the construction of the appliance itself, differs essentially from the methods usually followed.

For purposes of description the procedures are arranged in four sections, as follows: (A) Making the plate. (B) Making the obturator. (C) Assembling. (D) Making the spiral spring attachments.

Fig. 10.

Metal denture (vulcanite attachments) with backward clasp-metal extension and screw-post.

(A) *Making the Plate.*

A metal or vulcanite plate is constructed, with clasps, to cover the hard palate and any portion of the cleft in the hard palate. (See Fig. 10.) To the heel of this plate is soldered or vulcanized a clasp-metal extension, one-half inch wide, 22 gage, following the direction of the cleft in the soft palate, on which the obturator is to rest. To the center of the upper surface of this metal tongue is soldered a perpendicular screw-cut gold post, 14 gage, with a nut on its free end.

(B) *Making the Obturator.*

1. An impression of the mouth is taken in modeling compound with a suitably shaped impression tray, making no special effort to force the impression material into the cleft. (See Fig. 11.)

2. From this rough impression, a cast is obtained. (See Fig. 12.)

3. On this cast, an impression tray in modeling compound is shaped, embedding in the front of it a suitable handle of wood or metal, and in the heel, if found necessary, a wire loop, following the direction of the cleft in the soft palate, and lying immediately under it. (See Fig. 13.)

4. On this impression tray modeling compound is adapted, extending it back and building it well up over the wire

Fig. 11.

First impression in modeling compound.

loop at the heel; this is inserted in the mouth and a second impression is secured, forcing the soft impression material into the orifice of the cleft. While the impression material is soft, the patient is instructed to "swallow" several times, in order to obtain a more perfect adaptation to the boundaries of the cleft.

5. After withdrawal, the surface of the impression is roughened, a thin layer of soft impression plaster is adapted and carried to position, the patient is instructed to swallow several times, and, after hardening, the impression is withdrawn.

6. After withdrawal, by the aid of wax matrices a sectional model is obtained

Fig. 12.

Rough model obtained from first impression.

Fig. 13.

Impression tray of modeling composition with wood handle, for obtaining perfected impression.

in three parts, one part representing the anterior, the other two the posterior por-

tion of the mouth. (See Figs. 14 and 15.)

7. On this sectional model, which brings out the details of the cleft, a model of the proposed obturator is constructed in modeling compound, and to its inferior surface a wire handle about three inches in length is fixed, for convenience in handling. (See Fig. 16.)

Fig. 14.

Sectional model, obtained from last impression.

8. This model is tried repeatedly in the mouth, being held in position by means of the handle, until the muscles bounding the cleft are at rest, and then material is added, or any surplus thereof removed, until it fits the cleft in the mouth perfectly.

9. The model is removed from the cleft, the handle eliminated, and the model trimmed until it is smooth and ready for investing.

10. It is invested in plaster, obtaining a sectional investment in three parts, one being from the lingual surface of the obturator, the other two from its sides and upper surface; then the sections are separated and the model is removed from the investment.

11. An opening is cut through the top of this sectional investment, through which additional plaster may later be poured for the formation of a core. Before pouring the core, the inner walls of the investment are lined with sheet wax, leaving the center unfilled.

Fig. 15.

Another view of sectional model, parts separated.

12. The extension of a small gold hook is embedded in the wax lining the posterior portion of the investment, and then soft plaster of Paris is poured through the opening previously cut, filling the central portion of the investment and bringing it out flush with the rest

Fig. 16.

Model of proposed obturator in modeling compound with wire handle, for trial in mouth.

of the surface of the investment. Figs. 17 and 18 show the sectional investments and core.

13. The investment is separated, the wax lining previously adapted is removed, and the central core and sides are covered with tin foil; then the bottom piece of the sectional investment is flasked in one half of an ordinary vulcanite flask, and the other pieces, with the core in position, in the other half; then the flask is closed.

Fig. 17.

Sectional investment with core in position, ready for flasking.

14. The flask is separated, packed with vulcanite, and vulcanized slightly short of complete vulcanization, when a hollow hard-rubber obturator, with a small gold hook in its upper posterior portion, will be the result.

15. Into the anterior part of the upper hollow portion of the obturator, at a level slightly higher than the gold hook, one end of a clasp-metal tongue, 25 gage, $\frac{3}{8}$ of an inch wide, is fixed, its free end to extend back about three-fourths of the diameter of the obturator. On the under surface of this metal tongue is previously soldered a small gold hook, similar to the one previously vulcanized into the obturator. Now the obturator is vulcanized to complete vulcanization. (See Fig. 19.) To avoid a second vulcanization this metal tongue may be fixed in position in the wax lining of the sectional investment, when, on pouring the core, its proper relations are maintained.

(c) *Assembling.*

1. The obturator is placed in position in the cleft in the mouth, holding it in place by means of a string attached to it, which is passed through the nares.

2. The metal or vulcanite plate is placed in position, and on the under surface of the obturator, by means of the

Fig. 18.

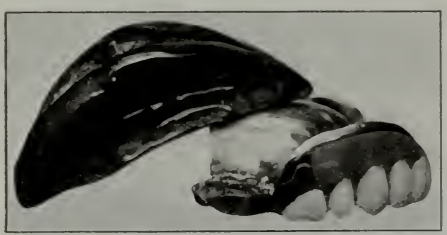
Sectional investment and core separated to show individual parts.

perpendicular screw-post on the metal backward extension of the plate, the location is marked of an opening to be cut, through which the screw-post is to pass.

Fig. 19.

Obturator, showing clasp-metal tongue and gold hook in posterior part, also spiral springs and nut with small "washer" for upright screw-post.

Fig. 20.



Denture and obturator assembled.

Fig. 21.

Obturator with spiral springs and other attachments in position.

3. The plate and obturator are removed, an antero-posterior oblong opening, about one-half inch long, is cut through the under surface of the obturator at the point marked, and a like opening immediately above it in the metal extension in the hollow part of the obturator, these openings to be slightly forward of its center to allow for backward play of the obturator. (See Fig. 19.) The plate and obturator are assembled by passing the upright screw-cut post on the backward extension of the plate, through the oblong hole already cut in the obturator, and also through the oblong hole provided for it in the clasp-metal tongue in the upper hollow portion of the obturator. Now the nut previously provided for that purpose is screwed into place on the end of the upright post, bringing it closely in contact with the metal tongue of the obturator. (See Fig. 20.)

Fig. 22.

Side view of plate and obturator.

Fig. 23.

Another view of the appliance.

4. The assembled plate and obturator are tried in the mouth to test their proper relations.

(D) *Making the Spiral Spring Attachments.*

Gold wire 20 gage is drawn down to 26 gage, to give it the necessary spring, and two spiral springs of the proper length are made to extend from the two small gold hooks previously mentioned in the hollow portion of the obturator, to the central perpendicular screw-post, one distally from the anterior and the other mesially from the posterior hook. (See Figs. 19 and 21.)

2. The nut on the end of the upright post is loosened, the end of one spiral spring is attached to the anterior hook, the end of the other to the posterior hook, and the opposite ends of both to the upright post; then the nut is screwed to the position which will give the metal tongue the proper tension to allow for upward and downward movements of the obturator. The spiral springs extend along the under surface of the clasp-metal tongue of the obturator, and are given the proper tension to regulate the backward and forward movements of the obturator. Figs. 22 and 23 afford additional views of the completed appliance, which is now ready for use.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

MODERN ATTACHMENTS FOR BRIDGE WORK AND STABILIZERS FOR LOOSE TEETH.

By JAS. KENDALL BURGESS, D.D.S., New York, N. Y.

(Read before the Maryland State Dental Association, at its annual meeting, Baltimore, Md., June 10, 1915.)

THE shell crown should have no place in the work of restoration in a well-ordered dental practice of today. This is a well-grounded conviction growing out of my observation of the shell crown extending over a period of about twenty-five years, an experience of nearly twenty years in its production and use, of considerably more than fifteen years as a clinical instructor in the making of it, and over five years' use of a substitute for it as a bridge and stabilizer attachment. It is a rule with so few exceptions that I am willing to let it stand as I have stated it, and to bear whatever of criticism or even of ridicule the stating of it may bring to me, looking to the future for my vindication.

Bridge work as a substitute for lost teeth has come to stay, and until some genius produces an adhesive which will obviate the necessity for a mechanical attachment the teeth will have to be used as abutments, and mechanical devices constructed to fasten the bridge to its piers. The proper construction of any mechanical device for such purpose necessitates alteration, by some method and to some extent, of the supporting teeth, and it is a fact which admits of no argument that that method which in degree and manner destroys the least and consequently conserves to the greatest extent all of the tissues of the tooth, both hard and soft, while insuring the proper security of anchorage; which looks to the future welfare of the supporting and surrounding tissues, restores or maintains the occlusion, and impairs in the least possible measure any of the functions, giving the esthetic function its proper value, is the method which should be chosen.

RÔLE OF THE SHELL CROWN IN THE EVOLUTION OF CROWN AND BRIDGE WORK.

Obviously it would be unwise and unavailing for me to condemn the shell crown if I could not offer a substitute with more virtues and fewer faults; and this, in large measure, is the purpose of my coming here. To do this it will be necessary to make some comparisons, in doing which I desire to discuss as concisely as possible the shell crown, giving it credit for all it has accomplished and deserves. That it has been a means to a great end and deserves our veneration I am glad to acclaim, and I yield first place to no man in my praise of the bridge—or in this instance the foundation which has made it possible—that has carried so many of us over.

I confess to having read little of the history of bridge work previous to my personal contact with it, but it is my conviction that the shell crown was the starting-point from which it has grown, the foundation that made the superstructure possible; and when we consider the boon that bridge work, with all of its crudities, has been and is to humanity, and realize something of the greater blessing it is destined to be when we shall have comprehended more fully the relation of the oral cavity and its contents to the whole human economy, and the proper functions of any means of restoration, not only in its mechanical aspect as a first aid to digestion, and its esthetic value, but in its relation to mouth sanitation; when we shall have worked out the crudities and brought bridge construction to that stage of development where it belongs, not merely as a serious engineering problem, an exacting mechanical production, and an artistic undertaking worthy of the best efforts of the best of us, but as a surgical procedure on a par, in its requirements of knowledge and skill and in the resulting benefits to our patients, with the operations done on many other parts of the body—in a word, when bridge work shall have come into its own—to have been the first stage in the development of a product so fraught with blessings and possibilities to humankind will be glory enough for the shell crown.

But most beginnings are crude and unsatisfactory. They best serve their purpose in pointing the way to a higher development. So must it be with the shell crown. There was a day when, for the purpose of the bridge attachment, it was the choice of evils and of its use it might be said that the end justified the means. But for me that day has passed. My interest in it is purely a sentimental one. So far as its practical use is concerned, I think it should occupy a place alongside of George Washington's teeth and the skeleton of the horse that drew the first car through the streets of Baltimore.

So much for the credit due. But why discard it? one might ask. Is it not as good as it ever was? Surely it is. So are the oxcart and the stage-coach, but they are not much used as means of inter-city or transcontinental travel in these days of the automobile and the Twentieth Century Limited.

WEAKNESS OF THE SHELL CROWN.

Let us examine some of its weaknesses. It would seem like carrying coals to Newcastle to tell an audience of dentists that if the shell crown is to be used at all, it should fit; and yet I doubt if any other operation has ever been performed so many times and by so many operators of which there has been so insignificant a proportion that would bear examination. By fitting, I mean that it should bear the proper relation to the tooth upon which it is placed, to the gum, to its fellow or fellows in the same jaw, and to the occluding tooth or teeth. It should also contain a sufficient thickness of metal in its grinding surface to bear the long and heavy strain of mastication which the patient has a reasonable right to expect to put upon it. The preparation of a tooth for a crown of this character necessitates, for purely mechanical reasons, the destruction of nature's entire protecting shell of enamel—with what shock to the tooth and harrowing experience to the patient is

perhaps only too vividly in your minds. Or, if you would spare the patient the more acutely distressing part of the operation—indeed, in many cases if you would make its proper performance possible and forestal what might otherwise occur as a result of it—it will be necessary to remove the pulp as a preliminary measure. This, I learn, is a fixed part of the technique of some operators. Thus of five tissues with which nature formed the dental organ, each with its special function, two have been entirely destroyed, and those that remain exposed to risk even in the most skilfully handled case and placed in jeopardy with anything short of the most expert care. Such mutilation, in the light of a better way, is no more justifiable in principle than the sacrifice of a hand where the amputation of a finger might suffice.

PLEA FOR PRESERVATION OF THE DENTAL PULP.

I am not one of those who hold the dental pulp in light esteem. To say that it has no function and consequently no value in adult life is to betray a woful ignorance of and lack of faith in the wisdom of an all-wise Creator. Nature does produce some freaks, but it is past believing that she would universally make the mistake of leaving the pulps in teeth past an age when there is nothing for them to do and when the teeth are as well or better off without them. The fact that pulps die or become diseased and have to be removed offers no adequate excuse for the indiscriminate destruction of normal pulps. Legs become gangrenous, kidneys diseased, and many other parts of our anatomy degenerate into pathological conditions that necessitate their removal; but the surgeon having a conscience does not remove these organs or parts except under the most serious provocation. The same principles should apply to the dental pulp. If we do not understand or appreciate its functions, we should be willing to lay the failure to lack of knowledge on our own part and not to lack of function on the part of the pulp. There is a mutual dependence of each of the tissues of the tooth upon each of the other tissues for its maintenance in the highest degree of health and service. And just as the eye cannot say to the hand "I have no need of thee," so may not any tooth tissue say to any other tooth tissue "I have no need of thee."

DANGERS OF AN ILL-FITTING SHELL CROWN.

I refer you to that marvelous dissertation upon the human body and the interdependence of its members and parts one upon another to be found in the 12th chapter of First Corinthians. All the pseudo-scientific poppycock ever uttered may beat upon it, but it stands through the ages, because it is built upon the solid foundation of truth.

This indictment presupposes, as I have said, the well-fitted crown. But what of the misfits?—that innumerable caravan that parades itself before the eyes of the profession, including all stages from the near-fit to that glaring burlesque in the case of which there has been no attempt whatever at tooth preparation and apparently no knowledge of such a procedure. The mere asking of the question brings the answer before your mental vision: Flaring band margins filled with cement forming great shoulders generally carried well into the soft tissues, and with what result? Irritation, inflammation, suppuration, dissolution of the alveolar process, destruction of the peridental membrane; exfoliation. To be sure, they do not all come out. Neither do all people who contract tuberculosis die of the disease, but that fact gives no warrant for the exposure of oneself and one's neighbor to the infection. In these days of increasing knowledge of auto-intoxication or bacterial poisoning, and the many ills that beset the flesh having their origin in the absorption of pus from the oral cavity, its admixture with the food in its passage into the alimentary tract, and the general unsanitary condition of the oral cavity, one might well wish more of them *did* come out, and more promptly, in-

stead of remaining to exert their baneful influence upon the whole human organism. Of great importance also is the condition frequently found where the lute has been dissolved out of the space between the band and the neck of the tooth—its place being taken by mouth secretions and food débris which, becoming stagnant, ferment and cause decalcification and decay, in many cases to the utter ruin of the tooth crown as well as the destruction of the pulp.

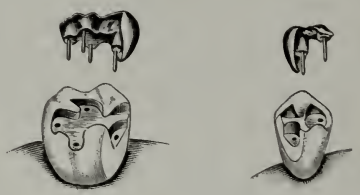
It comes to pass, then, that a well-fitting shell crown means great mutilation of tooth tissue, with pulp destruction as a preliminary or probable result, with possible impairment of the remaining tissues, and an ill-fitting one means serious pathological conditions of the surrounding and supporting tissues, with the resulting systemic disturbances, their gradual dissolution, the loosening and laming of the tooth with attendant discomforts and annoyances and incapacitation for service, and its ultimate loss. This is the more serious and practical aspect. It seems scarcely necessary to mention the esthetic side. I cannot conceive that the most ardent advocate of the shell crown would or could make any claims for it from that point of view.

I believe you must agree with me, then, that the shell crown even at its best is a vicious measure.

THE WRITER'S "PINLAY" ATTACHMENT.

But I have no intention of tearing down an idol without setting up something in its place. The change has come about through a discovery so simple that the statement of it will sound almost ridiculous, viz, that for purposes of the bridge anchorage there are two sides to a tooth, the outside and the inside. The shell crown utilizes the outside, and I have chosen the inside. That it is my own discovery, or that I am the first to make the choice, is not my claim. If I have increased its efficiency, and so have added anything to its value by my method of handling it, the knowledge of that fact will bring me ample reward. If it were in my power to state the case so clearly and with such acceptance as to bring about a discontinuance of the use of the shell crown with its attendant evils and establish the work of retention and restoration upon that high plane of development to the accomplishment of which I have given most of the best years of my life, I should be glad to leave the achievement as my monument. The attachment to which I ask your attention is a modified inlay and contour with pins, which I have chosen to call the "pinlay" attachment. The very mention of it leaves little to describe. (Fig. 1, A and B.)

FIG. 1.



A B

PREPARATION OF ABUTMENT.

The technique of its construction is simple, viz: I take a large saucer-shaped vulcarbo disk mounted with the concave side away from the handpiece, and slice away the contour of the tooth adjacent to the space to be bridged to such a point as that when rebuilt in gold it will give sufficient area against which to solder the suspended part of the bridge. The resulting surface I call the proximal plane, and in forming it I take away rather more of the linguo-proximal angle, and spare proportionately the bucco-proximal corner. This swings the metal contour more to the inside, where it is more available for soldering against and shows less gold in the finished work. I make no attempt to bring the cervical margin of this plane under the gingival margin, which would often entail a great loss of tooth tissue, especially in leaning teeth, while nothing would be gained. Then, with a small flat vulcarbo disk I slit the morsal surface of the tooth in its mesio-distal axis to a depth slightly below the level of the deepest portion of

the enamel. I follow this with a small ready-mounted carborundum wheel, increasing the width of the groove and by a lateral swinging movement widening it in the center of the morsal surface to a fan shape. Next, with the very small carborundum cavity wheels I cut out the sulci, and widen them generally with a very small inverted-cone cavity stone. Up to this stage I call the operation "roughing up." For the finishing I use a small carborundum cavity stone of cylindrical shape with flat end and keen edge. With this I parallel and smooth the walls, flatten the floor of the cavity, and sharpen the angles where they meet. Now, beginning with a small inverted-cone cavity stone and finishing with the cylindrical stone held with its base toward the cervix. I cut into the proximal plane a longitudinal groove the diameter of the stone bucco-lingually, of approximately equal depth in its cervico-morsal aspect and two-thirds as deep mesio-distally. This is the proximal groove and shoulder. It strengthens the angle connecting the inlay and the contour and gives a substantial shoulder, or rest, at a much-needed point for bearing the strain put upon the bridge. There remain now only the pin openings to complete the work of preparation. These may be two or three or four according to the tooth under operation and what seem to the operator the necessities of the case. I usually place one at or near each extremity of the cavity and one in the proximal shoulder just mentioned. They are made far enough inside the enamel edge to avoid the risk of chipping it, but far enough from the pulp to bridge it safely. I use for this purpose a spear drill made from a number 1/2 revelation bur and drill to a depth of 1/16 to 3/32 of an inch according to circumstances. By the use of the pins the cavity may be made shallower than would otherwise be necessary for proper retention, and the lateral strain is better distributed. Whether it be an upper or a lower molar or bicuspid the same principle of preparation holds good, the details differing with the size, shape, and position of the tooth, the number of its cusps, and the angle at which it stands. It should be very clear that in preparing two or more teeth care should be taken that all proximal planes and cavity sides are made parallel or diverging slightly in the direction of cervix to morsal surface, and that all pin openings should be as nearly as possible parallel to each other and to the cavity walls.

As a means of reducing the pain of preparation to a minimum, I keep the small stones bathed in "dentalone" and prepare a new drill or put a keen edge on the old one for each case.

CONSTRUCTION OF "PINLAY" ATTACHMENT.

The abutment being prepared, we proceed to the attachment. On account of the use of pins I use a matrix in its construction, though I learn that my friend Dr. Hardy obtains excellent results without it. But Dr. Hardy gave me my first instructions in crown and bridge work and is one man to whom I always accord the privilege of outdoing me. The matrix is made of pure gold 2/1000 in. in thickness, and is easily adapted with ordinary burnishers and bibulous paper and one or two annealings. These matrices may be roughed up in plaster models made from small modeling compound impressions, but should always be finished in the tooth. In trimming, I leave a narrow margin of surplus all around. For the pins I use 24-gage platinum and iridium wire, and prepare as many as needed for the case before fitting the matrix, taking away the bur edge of the wire with a metal file, and with a pair of small flat-nose pliers bending the end at right angles, making the pin slightly longer than the depth of the pin opening. About 1/32 of an inch beyond the bend it is cut off, leaving the elbow to handle it by and to secure it in the wax. The matrix in position is punctured at the pin openings, the pins are placed in position, and a small quantity of adhesive wax is flowed around each pin and against the matrix. There is no necessity for soldering these pins to the matrix.

If adhesive wax made from the following recipe is used, it will hold the pins securely and burn out so cleanly as not to interfere with the casting: Melt together 3½ oz. white wax, 1½ oz. gum dammar, and ½ oz. rosin. Inlay wax may now be flowed into the matrix, the contour built on and shaped up, the whole adjusted to the occlusion and removed for casting. This final shaping and adjusting may be done in the mouth in most cases, though occasionally I remove the matrix after securing the pins to it, build it up out of the mouth, and replace for final adjustment. With the duplication of the wax model in gold and the trimming away of surplus margins of matrix material the pinlay is ready for adjustment in the tooth and the taking of the bite and impression.

Now let us revert to the shell crown and make some comparisons.

CONSERVATION OF TOOTH TISSUE AFFORDED BY THE "PINLAY" ATTACHMENT.

(1) Conservation of tooth tissue. The proper preparation of a tooth for a shell crown necessitates the removal of the morsal surface and four contoured surfaces, besides the angles formed by their union—conservatively speaking, five surfaces—while for the pinlay I am sure I do not remove more than one-half of the morsal and one-half of the proximal surfaces, making a total of one surface, or one-fifth as much tooth tissue; I believe this to be a conservative estimate. What does this mean? It needs no statistics, were I prepared to give them to you, to impress upon your minds what it would mean to conserve four-fifths of the tooth tissue that is ground away today. I believe it is a very modest claim that it would mean a saving in time alone to both patient and operator of from one-third to one-half of that now consumed in the work of preparation. This in turn would mean to the dentist either conservation or a wider and more profitable distribution of his energies, according to the demand for his services. It means to the patient the lessening in the same degree not only of the physical pain, but of the anxiety and nervous strain and apprehension always accompanying such operations. It means the saving of many pulps now being sacrificed as a preliminary measure, and reduces greatly the danger to many more of death with all the consequent annoyances from shock and from the changed conditions brought about by the destruction of nature's own means of protection. And it means the conservation of the enamel surfaces with all their charm and beauty and esthetic value.

ESTHETIC ADVANTAGES.

(2) The second comparison I desire to make has to do with artistic values. If it be true that the esthetic is a very important function of the teeth, it must be granted that the nearer they remain to the normal, the better they serve that purpose, and conversely, the greater the departure from the normal the greater the impairment of that function. Inasmuch as the pinlay when properly constructed shows in the finished work only in the morsal surface and does not cover all of that, and the shell crown covers the entire morsal and buccal surfaces, I need only call attention to the comparative artistic values of the two surfaces and of the two materials, enamel and gold, to substantiate my claim that the gold crown is a blight, while the pinlay, though not an unmixed joy, is comparatively inconspicuous.

SAVING IN TIME AND MATERIAL.

(3) My third comparison relates to time and material, the time here referring to the work of construction after the preparation is completed. These should be items of practical concern to us all. To one whose fees are large the time is of corresponding value, and as the scale of fees descends, both time and outlay for materials become matters of increasing importance. I have no figures, but state my conviction, based on long experience, that the work of constructing the matrix and wax model for casting

the pinlay, under ordinary circumstances, should not consume more than one-half the time required for making the shell crown, and that the amount of material necessary should be in even smaller proportion. I am making comparisons of attachments equally well and substantially made, and fitted with equal accuracy.

EASE OF EXECUTION.

(4) My fourth comparison refers to the difficulty of execution. After all, here is where much of the nerve strain comes, and nerve strain is what "takes it out" of a person, as we say. Every man experiences it for himself, and knows how much more wearing and exhausting are mental concentration and nerve strain than mere physical exertion, and anything that lessens these saves his fuel and lengthens his period of usefulness. That the construction of the pinlay is an operation very exacting in its requirements and necessitating a considerable degree of skill for its performance is not to be denied, but given the requisite skill the details are fewer and less annoying than are those of the construction of the shell crown. In the case of the pinlay we have the tooth comparatively little altered in preparation from the normal lines and affording an easy guide in building the wax model to restore the normal tooth form, whereas in the case of the crown not only must the fit of the band to the tooth be made very exact, but all the relations must be established, viz, to the gum, to the adjacent tooth, to the occluding teeth, and to the alinement. I remind you again that my reference is to the properly made and adjusted shell crown. I know that some have regarded the making of the matrix for the pinlay as a bugaboo; I think the trouble lay in trying to use too thick a metal. I have no difficulty in handling gold of 2/1000 thickness.

EFFICIENCY.

(5) My fifth and last comparison brings up the question of efficiency, which must be the final test of the value of any operation. To serve the highest purpose, any bridge attachment must perform three functions. It must support one end of the suspended part of the bridge, it must afford secure attachment of the bridge to the tooth abutment, and it must protect all of the tissues of the tooth as well as its supporting tissues, as far as its influence extends, from injury and disease and the lessening of their usefulness. I present no argument against the effectiveness of a well-made shell crown in supporting the bridge and securing it to the tooth in the case of a long or medium-length tooth, or even what might be termed a medium short tooth, but there is a length below which I believe it will be conceded that a plain shell is not dependable, certainly in the case of a bridge of considerable length, or where there is severe strain to be put upon it. I have found the pinlay absolutely dependable, from every point of view, in every case where a shell crown would be effective and in the class of cases, as well, of which I speak, where the shell crown is not trustworthy. It presents the proximal contour for the bridge support; it fits the cavity approximately at every point and when cemented to position becomes to all intents and purposes a part of the tooth, and takes advantage of all the strength the tooth possesses. In its external aspect it is like any other cast gold inlay, and affords the tooth the same protection. It does not impinge upon the soft tissues, and offers no obstruction to prophylaxic efforts on the part of either patient or operator. So that, with all that the shell crown costs both patient and operator to produce, there is no particular in which it is more efficient, while it falls short in some points, notably in respect to its futility as a protective measure for the pulp in many cases where that organ has not been removed. And it is very rare to find a crown of such perfect adjustment that it does not either form a shoulder or crevice at or above the gum line for the accumulation of food débris and the vitiating products of mouth secretions; or else under the gum line, where it is a

constant menace to the welfare of the supporting tissues. I am still speaking of the well-fitted crown. The moment we get away from absolute accuracy of fit and adjustment, there comes the question of sanitation and the welfare of the supporting tissues. Of the remaining anomalies and monstrosities —with their thin walls that tear out under the stress of mastication; with their paper-shell grinding surfaces that wear through and make possible the dissolution of the cement and the consequent destruction of the tooth crown; with their flaring bands and putrefying food pockets whose offspring are the decaying cervix and suppurating tissues, with all their pathological consequences—suffice it to say that it would be degrading to the word "efficiency" to discuss it in connection with them; "criminal inefficiency" is the term that characterizes them and their perpetrators. I do not condone carelessness in pinlay construction, but it seems scarcely possible that any pinlay that could be used at all could be as inefficient or as vicious a measure as the frail and ill-fitting shell crown that comes so frequently under our observation.

"PINLEDGE" BRIDGE ATTACHMENT FOR ANTERIOR TEETH.

That brings us to the bridge attachment for anterior teeth. The same underlying principles that have been stated with reference to the bicuspids and molars should obtain here; the same aims and aspirations and ideals should govern the operator, viz, the greatest security of anchorage with the least possible disturbance of any of the tissues or functions of the teeth and with the greatest safety to the welfare of their supporting and surrounding tissues. These details have been gone into fully and I shall not re-state them. The anterior attachment is an outgrowth of the pinlay, being constructed on the same principle. I have chosen to call it the "pinledge." (Fig. 2.) The name indicates its nature. The details of preparation and construction are as follows: With a large saucer-shaped vulcarbo disk the linguo-proximal angle of the tooth adjacent to the open space is flattened somewhat, but not enough to disturb the anterior enamel plate or to bring the metal of the finished work into view. Then with a cylindrical carborundum stone of the ready mounted type, say 1/4 of an inch in diameter and with a very keen edge, two notches are cut across the lingual surface, one just short of the shoulder, which I call the cervical notch, and the other about one-half or two-thirds the distance between this point and the incisal edge, which I call the incisal notch. These notches are cut to approximately the depth of the enamel. Then with a small

Fig. 2.

keen-edged cylindrical cavity stone placed in the center of the cervical notch, with its base toward the cervix, bearing toward the pulp, is cut a vertical groove or depression called the cervical groove, the width of the diameter of the stone and about one-half or two-thirds that depth measuring from the lingual surface toward the pulp. I repeat this operation in two places in the incisal notch, making one groove near the linguo-distal angle, the disto-incisal groove, and the other near the linguo-mesial angle, the mesio-incisal groove. These incisal grooves must vary in depth, of course, with the thickness of the incisal edge of the tooth, care being taken not to mar or endanger the labial enamel plate. For the same reason the incisal notch and grooves may not always be cut so near the incisal edge, though the nearer they can be cut to that point the better will be the distribution of the strain.

In cases where there is need for unusual strength of attachment, I make two vertical grooves instead of one in the cervical notch, starting at the linguo-mesial and linguo-distal angles and working in the direction of the pulp. These are the mesio-cervical and the disto-cervical grooves respectively. All the grooves should be finished with very keen-edged stones, leaving sharp angles where the walls join the ledges. Thus we have, usually, three or four vertical grooves, as the case may be, the floor of each forming a shoulder or ledge with corresponding name, for support of the completed attachment. There are many possible variations on this theme. Several are shown in Figs. 2, 3, and 6. The stone work is thus completed. Following this, with a spear drill made from a No. 1/2 revelation bur, the pin openings are made, one in each ledge near its center, in any event far enough from the enamel on the one side to avoid chipping or splintering it, and from the pulp on the other side to leave an ample margin of safety. These openings vary in depth from 1/16 to 3/32 of an inch. To construct the attachment, gold 2/1000 of an inch in thickness is burnished accurately to position; the surplus is trimmed away, leaving a narrow margin of excess; the pin openings are punctured into and the pins placed in position and secured to the matrix with adhesive wax; sufficient wax is now flowed to stiffen the matrix; all margins are burnished accurately to place, and the attachment is withdrawn for completion. The pins are of 24-gage platino-iridium wire made as described in the directions for pinlay construction. These attachments may be shaped up with inlay wax and cast if desired, but I prefer to invest and sweat 22-k. solder over the back, filling out their normal shapes. The results are as satisfactory, and the process is much simpler and quicker. When the attachment is complete, it will be seen that its ledges rest firmly against the ledges of the tooth, putting the strain directly upon the tooth, while the pins in their turn secure the attachment in its position when cemented—that it may not slide from its moorings lingually nor move toward the incisal edge. Thus it becomes, as we said of the pinlay, part and parcel of the tooth, and takes advantage of all the strength the tooth affords.

I prefer the method of preparation described to that of cutting the two notches across the tooth of sufficient and equal depth, for these two reasons:

First, because it saves a considerable amount of tooth tissue, which is of great importance near the incisal edge as a protection to the labial enamel plate.

Second, because the irregularity of surface thus obtained increases the security of attachment to the tooth.

It seems unnecessary to make comparisons with other attachments for anterior teeth such as the shell crown, the open-faced crown, the gold band, the backing and post that necessitates the removal of the pulp, the porcelain and band crown, and the pivot tooth for the placement of which good teeth must be excised, etc. It would be hard to believe that any operator of standing and ability would use some of these methods in this enlightened age with many better means at his disposal; and concerning the others there seems to me little room for comparison. If there be, much that has been said by way of comparing the pinlay and shell crown will apply equally well as between the "pinledge" and other anterior attachments—at least those with which I am familiar; and I have made and used, I think, most other kinds.

COMPOUND BRIDGE ATTACHMENT.

This brings me to another phase of bridge attachment, viz, the compound attachment. There are many places where a reasonable degree of efficiency requires attachment of a bridge to two or more teeth, and many more where it is strongly to be advised: Any case requiring a bridge of considerable length where attachment must be made to single-rooted teeth, unless perchance to a canine, or particularly favored by the bite: any case in which anchorage is lame or frail, or in which one or more teeth ad-

jacent and beyond the anchorage are lame or frail. Such cases as these require the compound attachment to give strength and durability to the bridge and security to the lame and frail teeth. With such simple and inconspicuous and efficient attachments at command as the pinlay and pinledge, their construction is so simplified as to leave no excuse for placing a bridge on an insecure foundation when a stronger one may be had, or leaving a frail tooth that might so easily be strengthened.

There is a little additional to be said about the preparation for the compound

Fig. 3.

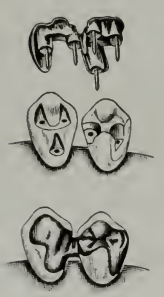
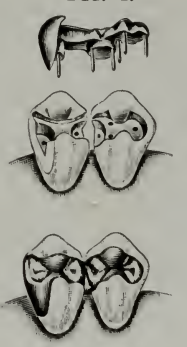


Fig. 4.



attachment and its construction. In many cases it is merely a combination of two or more simple attachments soldered together before taking the impression—or, as I prefer, at the final soldering. (Fig. 3.) Usually, however, when two or more posterior teeth to be used are in contact or nearly so on their proximal sides, I prepare them much as if they were one tooth with a long morsal surface, widening and deepening the cavity somewhat, at the points of contact of the teeth, for greater strength of union and security of attachment. (Fig. 4.) The matrix and wax model are made and cast in one piece. In the case of anteriors they are prepared, of course, individually, and the matrices made in one piece when the teeth are sufficiently close together. Whenever the space between them necessitates it, the matrices are made and waxed up separately. In either case a German-silver wire is adjusted and secured across their lingual surfaces with adhesive wax, and the whole is carefully removed and soldered as one piece, no impressions being necessary at this stage of the work.

In soldering, where the space is too wide to make the union easily with solder, the connection may be made with platinum and iridium wire of about 17 to 19 gage.

STABILIZERS FOR LOOSE TEETH.

We come now to stabilizers for loose teeth. I want to make it very clear at the outset that I do not advocate the stabilizer for the retention of loose teeth in pathological surroundings, nor as in any sense a substitute for the surgical treatment and cure of pyorrhea. It is not my purpose to discuss pyorrhea, but I state it as a fact to which any man who knows Hutchinson's work must agree, that it can be cured and is being cured every day, according to what I consider a reasonable understanding of the word "cure." If a man contracts blood poisoning and it becomes necessary to amputate his arm in order to save his life, it might be argued when he is restored to health that he is not cured, because his arm is not restored. It would be just as reasonable to argue that a man recovered from smallpox is not cured because the scars remain. The tissues in a mouth affected with pyorrhea may be restored to a healthy condition. So far as I know, lost tissue cannot be restored, but it seems to me the merest quibbling to say on that account that the condition is not cured. When this lost tissue amounts to the moving back of the fulcrum from the point of stress far enough to increase the leverage past the point where the remaining tissues are sufficient to hold the teeth involved reasonably firm under such service as they are called upon to perform, their support must be supplemented.

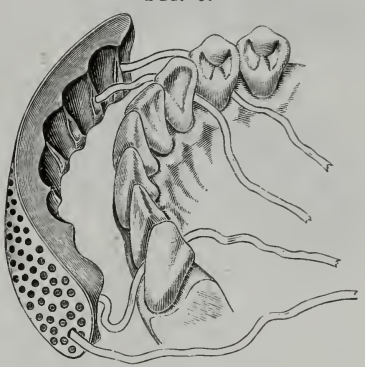
Tissues constantly exposed to the traumatic influences of loose and swaying teeth cannot remain or be maintained in a normal state of health and resist-

ance. They will inevitably be reduced in vitality and become a constant prey to infection. Added to this will be the absorption of the socket walls from the increased mechanical pressure, bringing about a condition where the teeth ultimately will be lost for want of sufficient tissue to retain them, or their removal necessitated to relieve an unbearable situation. There have been many methods and devices for stabilizing teeth, but as far as I have observed they are open to the same objections as the methods of bridge attachment to which I have referred, and bear about the same relation to the methods I bring to your notice that those methods bear to the pinlay and the pinledge.

Fig. 5.

I have already spoken of securing lame teeth by the use of the compound bridge attachment, and that of itself is stabilizing. Indeed, the stabilizer is merely an amplification of the pinlay or the pinledge, or both in combination, as the case in hand may require (see Figs. 5 and 7), and not much more need be said about it, except to mention a point or two concerning the technique of preparation. Perhaps the most frequent cases requiring stabilizers are met with in the anterior part of the mouth, and I have chosen such a case as the basis for such explanations as it seems necessary to make. In planning the work, firm teeth, if possible, should be selected as abutments to which to secure the ends of the stabilizer. The teeth needing support are frequently too loose to be operated on without some temporary means of steadying them. In some instances a well-applied ligature will suffice, but usually in such cases I construct a splint as follows: First ligature the teeth, flow a small quantity of plaster on the lingual surfaces, or otherwise secure them in their correct positions so that an impression of the labial surfaces may be taken without disturbance. Take a piece of German-silver plate, about 30-gage, of a width and length to cover the labial surfaces of the teeth under operation. Perforate this plate liberally with a plate punch, and bend it to fit approximately the labial aspect with the rough side toward the teeth. Place a thin layer of modeling compound over the roughened surface; heat it well and press gently to position, making a fairly deep indentation of each tooth in the compound. (Fig. 6.) Cool

Fig. 6.

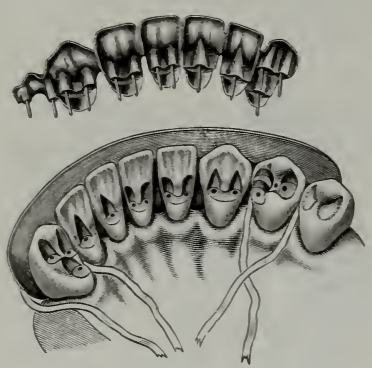


and remove. Drill a hole in each end of the splint between the last two teeth or on each side of the firm tooth nearest each end. Thread a strong ligature through each opening (see Fig. 6), and after removing the ligature from the teeth, or temporary material from the labial surfaces, place the splint in position, and tie it securely to the firm teeth. When properly made and secured, this splint is not bulky enough to interfere with the patient's comfort while in the chair; it holds the teeth in their correct positions; it affords ample support during operation, and can be easily removed and replaced if necessary. In preparing the teeth I do not usually disturb the linguo-proximal angles unless an angle is contiguous to a space to be supplied.

Nor do I always cut the incisal notch and grooves, in many cases contenting myself with the cervical notch and two grooves and ledges with well-placed pins of good length, and even with one groove in occasional cases. (Fig. 7.) These variations depend upon stability, occlusion, and other conditions which must be determined by the operator in each individual case. The methods of construction have been described.

I repeat that I make the matrix for the entire stabilizer in one piece whenever possible, remove it with a German-silver wire secured across its lingual surface with adhesive wax, and solder it always in one piece at one soldering, using platinum and iridium wire of about 17 to 19 gage to bridge such spaces as cannot be bridged easily with solder. In every case, whether of simple or compound matrix, care should be taken to burnish all margins thoroughly to position the last thing before removing.

Fig. 7.



The method of extracting teeth too loose to be saved, excising their apices and bridging them in with the stabilizer comes more properly under the head of bridge work, which is not the province of this paper. I have described to you what I consider a typical case. There are many variations, in working out the details of which the operator must exercise his own judgment and ingenuity: but the same principles underlie and govern them all. When properly made and placed, the pinlay and pinledge stabilizer adds little bulk, beyond replacing the small amount of tissue removed in preparation; it is out of view in the anterior part of the mouth and inconspicuous in the posterior, and affords no harboring-places for accumulations that cannot be removed by the same processes by which the teeth under normal conditions may be cleansed.

CRITIQUE OF REMOVABLE BRIDGES.

In describing these attachments and the preparation for them it must be apparent that I have spoken of teeth with normal crowns or those so nearly normal as not to necessitate a wide departure in the method of handling them. Neither time nor your patience would suffice, nor is it necessary, for me to go into the question of malposed, carious, and filled teeth, and all the deviations from the normal, in their relations to bridge and stabilizer attachments. The diversity of combinations is as numerous as the mouths in which they occur; but, while the details of their handling must vary with each case, the basic principles remain the same. You must have noticed, too, that the attachments and methods I have described are for stationary work. I shall not feel it incumbent on me to make bridge work that must be removed for cleansing until a wise Providence leads the way by constructing the natural denture on that plan. I have a theory of sanitation in its relation to bridge work that I have not heard successfully controverted. It is that a properly constructed bridge is as clean as the patient who wears it. By that I mean that, if a patient who will properly cleanse his natural teeth will give the same time and care to his bridge, in proportion, he may cleanse it as well: and the patient who will not cleanse his teeth will not cleanse his bridge whether it be stationary or removable. The same time and trouble required to cleanse a removable bridge out of the mouth and the abutments in the mouth would be sufficient to cleanse the stationary bridge in the mouth, and the

man who will not cleanse his bridge in the mouth would not take it out to cleanse it, and an unclean removable bridge is no more sanitary than an unclean stationary bridge. This bears on one of two chief arguments I have heard advanced by the advocates of the removable bridge. The other is that it may be taken out for the purpose of repairing it. My experience convinces me that only a small percentage of bridges need repairs, at least of a kind requiring their removal; and to make all bridges removable in order that the few may be the more easily repaired savors too much to me of dosing every man in the community on castor-oil because one man happens to be constipated. Dr. Grieves many years ago gave expression to a vital fact in crystallized form when he said, "One of the chief advantages of bridge work is its splint value," and even if this important function were not much better served by the stationary bridge, the removable bridge is so complicated in technique and so destructive of tooth tissues beyond all reason as to put it entirely outside the pale, at least of my consideration.

CONCLUSIONS.

I have confined myself to bridge and stabilizer attachments and to matters pertaining directly to them, because here is where the great reformation in the work of retention and restoration is needed. The pinlay and pinledge lend themselves to any method of bridge construction that can be used with the shell crown and other attachments in common use, and important as that subject is, it is neither needful nor auspicious that I should enter upon a discussion of it at this time. But I assure you that such things as I have brought to your attention are no overnight ideas of mushroom growth. They have been tested and tried, not on models and in showcases, but in the only environment and under the only conditions that can properly be called a test, *i.e.* in the human mouth and under every condition of actual service. That they are perfect would be a foolish claim, and I do not make it. The ideal is unattained and unattainable. There will always be a sufficient margin between the greatest achievements of any man and the ideal to constitute a spur and a lure to the ambitions of those who come after. It will depend upon the spirit that is in us how we take advantage of the opportunity thus afforded. Shall we stand pat upon what has come to us out of the past, and make no effort to build upon it for the benefit of the succeeding generations? "Let well enough alone" is the wail of the sluggard and the death knell of progress. And where lies our goal? Is it in mere material advantage to ourselves—the sordid desire to capitalize the misfortunes of those who come under our care, without the giving of our very selves as it were in return? Or do we accept the responsibility that comes to us as a sacred trust and give more and better than any mere material reward can ever compensate for? No man rises in his service to his fellows above his conception of his duty to his fellows. "I came not to be ministered unto, but to minister" is the motto that has stood for twenty centuries as the inspiration to every achievement that has been worth while in the world; and no man who follows the line of least resistance, and does things this way or that solely because they are easy; sticks to old methods rather than pay the price in time and patience and effort to learn new ones; in time, material, effort, or otherwise takes short cuts to the emoluments; or in any way sacrifices the welfare of his patient for his own benefit, has caught the inspiration of that motto or serves best the highest aims and ideals of his profession. Disease is a blight. Caries and pyorrhea ravage the teeth and their supporting tissues. Our mission is to fight these enemies and put every possible obstacle in the way of their progress, not to join hands in their work of devastation. Conservation is a sacred duty. Just as orthodontia has taught us so much in recent years of the importance of establishing and maintaining the proper relation between the teeth in

the opposing jaws, and the great benefits that accrue, just so must we come to a better understanding of the vital relation existing between the parts of the individual tooth and between the teeth and their supporting tissues, and learn—to paraphrase a very wise man—that "Whether one part suffer, all the parts suffer with it."

I make a plea for methods based on the principles of surgery *versus* butchery; of art *versus* vandalism; of prophylaxis *versus* pollution; of conservation *versus* desecration.

Discussion.

Dr. C. V. Matthews, Baltimore. Our essayist has touched on one of the most vital problems in dentistry, that is, the mechanical side of bridge work. Of course we have been doing inlay work for many years, but we have all had our own ideas about the way inlays should be made. The essayist's idea of employing the "pinlay" as an abutment in order to avoid the mutilation of the whole tooth is quite an advance, and will be a help to us all. We have all been trying for years to get away from the gold shell crown necessitating mutilation of the tooth, and the band around the tooth at the gum margin which is liable to cause pyorrhea, and within the last few years we have been using inlays, with or without pins, depending on whether we have sufficient depth to impart strength to the inlay, in an effort to get away from the use of bands, and I am sure that Dr. Burgess' ideas in this connection will be of great benefit to us in the future.

Dr. H. E. Kelsey, Baltimore. There is one phase of this subject that interests me particularly as an orthodontist, and that is the fact that, in the methods of restoration presented to us by Dr. Burgess, the possibility of accurately restoring that portion of the tooth which is sacrificed for the abutment is much greater than with the older methods, such as the shell crown. I always thought when I was engaged in general practice that it would be very desirable to have such a method, but of course the new form of abutment had to be evolved first, and it was a long time reaching its present state of perfection, after which it required such men as the essayist to apply it successfully to other dental problems such as bridge work. Dr. Burgess in his paper has taken the position of first doing the thing, and telling us about it afterward. The feature of this work that appeals to me most, as I say, is the ability to restore the occlusion properly. I believe the orthodontists deserve some credit for calling attention to the importance of this phase, notably Dr. Young.

Dr. R. O. Sadler, Baltimore. There is no doubt to my mind that Dr. Burgess has perfected the technique of these abutments to the extent that it is the duty of the profession to consider it very seriously. I have been impressed in the last few years with the great harm that we are doing our patients by covering abutment teeth with all-gold crowns. I remember seeing Dr. Burgess, as a demonstrator in the Baltimore College of Dental Surgery, make what I considered the most perfect gold crowns I had ever seen. It seemed that he had gotten the technique down to an exact science, and yet he comes to us today with something that he thinks is better. It seems to me that he has developed a phase of this work to which we shall have to pay more attention. Our patients will demand that we abstain from the mutilation of abutment teeth, and our own desire to do the best for our patients will make us more careful as to how we construct gold crowns, if we use them at all. It seems to me that this is the logical end toward which we are working, and the young men coming into the profession now will have these ideals set before them, and will have a distinct advantage over the men who were graduated some years ago. It is a duty which we owe our patients to do for them the best we can; they are insisting upon this more and more, and the best is none too good for the human body.

Dr. Edward C. Kirk, Philadelphia. I know very little about the subject pre-

sented to us this morning, but as I listened to the very interesting presentation of it, I was constantly thinking of the pathological side of the matter, or the physiological side of the matter, in relation to what I consider to be the ideal of the essayist in getting away from the type of bridge attachment that has been in a large degree an insult to the retentive tissues of the tooth. I am in almost daily contact with Dr. Peeso and his colleagues, and I have been constantly reminded of this point, that until we can devise a bridge attachment by which the contact of the mechanical construction with the living tissue is brought down to the degree of perfection demanded by the man who puts in a contour gold filling so shaped that it shall not be productive of irritation, we have to contend with a constant pathological menace. I see in the type of restoration presented by the essayist, as far as I can understand it, the recognition of that principle so far as irritation of the pericemental ligament is concerned. The essayist condemns the shell crown because of the physical impossibility of making it so that it shall not be in some degree a cause of irritation, and we know the results of that irritation to the tissue; we know that it means the ultimate breaking down of the living attachment of the tooth. On the other hand, those who have studied the remarkable expressions of vital reaction upon the part of the dental pulp to all sorts of irritation must also raise a question. The essayist in dealing with his problem has met the demand for the preservation of the tooth structure, but all of us realize that we cannot break the integrity of the enamel surface and impose upon the surface of the denuded dentin a metallic substance which is a better conductor of heat than is the enamel surface removed; we cannot remove the slightest portion of enamel without the pulp taking cognizance of that fact. If you make sections of teeth which have the slightest beginning of caries, sections longitudinal to the pulp, you will find that the pulp will record its irritation before the dentin is reached by the advancing caries. It is the same with mechanical abrasion of the tooth surface, which is immediately registered in the reaction of the dental pulp to the irritation, by the laying down of secondary dentin or the production of nodular calcifications within the pulp structure. I raise the question as to what will be the ultimate history of this operation with reference to the way the pulp will react in response to this cutting of the enamel surface. I rather suspect that in getting rid of the irritation to the peridental membrane by making these pin-and-plate attachments or pinlay attachments, that the essayist has chosen the lesser of two evils. My inquiry is in no sense condemnatory, for after all, every dental operation we do is necessarily a compromise with disease conditions, and it should be the ideal of the dental operator to compromise with disease conditions upon terms of greatest advantage to the patient, and it seems to me that this operation is one of those compromises. I have listened with great interest and pleasure to this exposition, and in raising the questions I have I do not want to be placed in the attitude of throwing a cold blanket on the excellent presentation made by the essayist, but I want to consider what may utimately happen to the tooth treated by his method in the years to come.

Dr. Burgess (closing the discussion). Dr. Kirk has carried one of the chief points of my paper a little farther, and perhaps has expressed his argument a little more clearly. We are shooting at the same target, and he has drawn a little finer bead. His argument strengthens my position with reference to the conservation of tooth tissue, unless one should read into his remarks a conviction that inasmuch as even the slightest alteration of any tooth tissue brings about a corresponding change in the pulp, it would be better to destroy all pulps in teeth that must be operated upon, however small be the operation. Whatever theories might be advanced in favor of such a procedure, the thousands upon thousands of teeth that retain their vitality during the patient's lifetime, as

has been observed by every dental practitioner, are a practical evidence of the falsity of these theories. I am sure that neither Dr. Kirk nor any other sane man would seriously consider such a proposition.

Dr. Kirk may have in mind, though he has not said so, the use of the partial denture instead of the bridge. I know that many operators favor this method of restoration, and all of us must decide more or less frequently between the partial plate and the bridge; but a discussion of the relative merits of the plate and the bridge is not within the scope of my paper. My concern, at present, is the bridge, and what I consider antiquated and vicious methods of attachment. I have already said that, until some genius invents an adhesive for the attachment of a bridge without alteration of the teeth, some alteration and consequently some destruction of tissue must be brought about, and my plea is for that method which destroys the least possible amount commensurate with the proper strength of the attachment. Any condition that necessitates an operation is abnormal, and we can never restore such a condition to normal; but that fact does not excuse us for not trying to approach the normal as nearly as possible. I am glad to interpret Dr. Kirk's remarks as an assent to my position. I have not kept any record of the effect of the preparation for the "pinlay" and the "pinledge" upon the pulp, partly because I have not seen the necessity for it. So far as its relation to the pulp is concerned, I consider it about the same as that of an ordinary cavity preparation. I have no statistics of pulp losses, but they have been very few in the five years or more during which I have used these attachments. Of these few cases, some, no doubt, have been due to unusual susceptibility or to abnormal size or position of the pulp, and some, alas! to my own carelessness or incompetence. I confess the fallibility.

I desire to thank Dr. Kirk and the other gentlemen who have discussed my paper for their generous attitude toward it, and the audience for their patience in listening to a rather long paper.

ORAL INFECTIONS.

By NATHANIEL GILDERSLEEVE, M.D., Philadelphia, Pa.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Reading, June 22, 1915.)

THE subject of oral infections is a broad one, and in discussing it one who has devoted some time to a study of such infections, from an etiologic, a pathologic, and a therapeutic viewpoint, evinces not a little hesitancy in approaching it; for, in spite of all that has been said and accomplished, our knowledge of many oral infections is by no means extensive.

CAUSES FOR LACK OF PRESENT KNOWLEDGE OF MANY ORAL INFECTIONS.

This lack of knowledge, it might be stated, is due primarily to four causes:

(1) Lack of interest exhibited by physicians in local diseases of the oral cavity.

(2) Lack of scientific education in a large proportion of dentists, owing to which fact they have been handicapped in recognizing and properly differentiating various infectious conditions of the mouth. Those who have qualified are in many respects self-educated, it being but fair to state that the dental practitioner cannot be blamed so much as the dental schools, since sufficient emphasis has not been laid on this very important branch of oral medicine and surgery. This un-

fortunate condition of affairs is being corrected at the present time, and when the four years' course is instituted in the various dental colleges, the student will have better training in this as well as all other branches making up the curriculum of our dental colleges.

(3) There has always existed an inexcusable lack of co-operation on the part of medical and dental practitioners. The professional relationships of these two bodies of men dealing with diseases of the human economy are yearly becoming closer, each group recognizing more and more fully the fact that they cannot work to the best advantage of their patients without this essential co-operation.

(4) The fourth factor of importance is one which can only be overcome by constant investigation, namely, there are numerous organisms constantly existing in the oral cavity the true significance of which have not been determined, owing to the fact that endeavors aimed toward the isolation of some of these microscopic plants and animals have not as yet been attended with success; furthermore, the importance of some which have been isolated has undoubtedly not been fully recognized, due partially to the haphazard way in which they have been handled by many workers, and partially to the fact that some of the diseased conditions cannot be reproduced in lower animals.

DIFFICULTIES ENCOUNTERED IN ISOLATING AND CULTURING ORAL BACTERIA.

The classic work of Miller opened up a field which has not been followed up in the way it deserved. How much longer we shall allow this condition of affairs to exist remains to be seen.

In dealing with these infections we are confronted with many difficulties. All who have studied microscopically both fresh and stained material from the oral cavities, in both normal and abnormal conditions, have been impressed by the great variety of organisms present —many of which have been named arbitrarily, with absolutely no available knowledge, excepting their presenting form and structure, as to their nature. One example of this which may be quoted is that peculiar and strikingly interesting organism known as the *Leptothrix racemosa*. This organism has never been isolated; what group it belongs to or what its function may be I would not attempt to say, but it certainly does not belong to the leptothricæ; the name is absolutely a misnomer. Furthermore, how disappointed we are when, on making cultures on all available types of medium from these same cases, but a few of the types of organisms found on microscopic examination will develop. What part the majority of these organisms which have thus far resisted all of our attempts directed toward their isolation, play in infectious processes involving the hard and soft tissues of the oral cavity no one can say at the present time.

Again, we may find several organisms of a known infectious nature in a given infection, and it is difficult to determine which plays the important part in the case under consideration, a matter of not a little moment when we are endeavoring to decide as to the proper treatment to be employed.

PREDISPOSING FACTORS AND THEIR INFLUENCE.

When considering oral infections it is of the utmost importance that the practitioner possess a knowledge of all phases of the situation. He should be familiar with the predisposing factors and their influence; with the nature of the infective agent, of whose mode of action he must have a clear realization, together with the pathologic effects caused by it, not only locally, but also when it gains access to the tissues via the blood stream, lymphatics, or follows along ducts and other passageways and induces infectious proceses in parts of the economy near-by or remote from its portal of entrance. Furthermore, it is essential that we know the manner in which the different organisms gain access to the body and invade the tissues.

That predisposing factors are of vastly more importance than many of us realize is a fact which must be constantly held in mind by all dentists, and they should in all instances determine what factor coming under this category is present in every case coming under observation. This cannot be determined by a cursory examination; it is essential to obtain a history of the case, call into service clinical diagnostic methods, including radiography, an essential and much neglected aid in many cases, not only as a means of diagnosis, but also for determining how far a process has advanced, thus enabling one to properly outline the treatment. Frequently it is necessary to consult with the patient's physician for the purpose of determining the presence of pre-existing disease, which is so frequently the underlying factor in oral infections.

Pre-existing or co-existing disease. The existence of diabetes, nephritis, or gastro-intestinal disorders, with a consequent absorption of substances exerting a detrimental action on the metabolic process constantly going on in the body, is very important. Disturbances of the organs governing internal secretions are, I might say without gross exaggeration, daily assuming greater importance as predisposing causes of infections. The work done on this branch of pathology within the past few years has given us an insight into many obscure general conditions which, by reducing the resistance of the tissues, predispose to local infections.

We must not forget that diseases of internal organs, other than those mentioned, are constantly producing effects which lower the resistance of the economy by destroying or preventing the formation of antibodies, by changing the composition of the blood, not only as affecting the corpuscular elements, but the chemical composition of the plasma and serum.

A knowledge of pre-existing or co-existing infections of other parts of the economy is of the utmost importance. The effect of typhoid fever and allied infections, tuberculosis, pneumonia, influenza, and other bacterial infections, such as malaria and syphilis, and amœbic dysentery among the protozoan infections, are worthy of much more consideration than is usually given them.

Fatigue. Fatigue, with the abnormal condition following fatigue called overstrain, is more often a predisposing factor to oral as well as other infections than is generally recognized, and it is stated, with some proof offered to support the contention, that certain nervous influences exert a predisposing influence.

Local injury or irritation. Local predisposing factors are so well known that it seems almost inexcusable to mention them. Such are injuries, hot liquids, the action of chemicals, the presence of foreign bodies, not only of external origin but foreign substances produced in the oral cavity, as salivary and serumal calculus, or originating in other parts of the economy. We must always bear in mind the fact that a normal structure, such as a tooth, may constitute a foreign body and act as an irritant under abnormal conditions.

Drugs. The use of drugs, not only the so-called habit-forming drugs but many others, must be included under the category of predisposing factors, and deserves more consideration than is accorded it. The well-known fact that many drugs are partially eliminated by the salivary secretory mechanism is not alone of importance from a therapeutic viewpoint, but from a pathologic one as well. In this connection one example may be cited, namely, the condition known as mercurial stomatitis. Many physicians and dentists will today evince marked incredulity when this is called an infection, yet such is undoubtedly the case. The inflammatory reaction and destruction of tissue, the vitality of which is in some manner reduced by the action of mercury, is due to the action of micro-organisms, a variety of which are to be found in all cases of this infection. All who have treated cases of this condition are familiar with the peculiar fetid odor present, an odor due in great part to the action of oral spirochætæ. This odor is not characteristic of mer-

curial stomatitis, but is characteristic of conditions in which the spirochætæ are active. One could write a volume on this phase of our subject; all the time at my disposal could be consumed in dealing with it, and, I feel, profitably, but before going on, let me emphasize the necessity of giving all consideration to predisposing factors, and the futility of hoping to cure oral infections without eliminating their influence.

MICRO-ORGANISMS AS EXCITING CAUSE.

The exciting cause of all infections is manifestly one or another of the vegetable or animal micro-organisms, the former including bacteria and higher fungi, the latter certain protozoa, or, as is frequently the case, two or more species of these organisms working in harmony, to the detriment of the host. In some instances, the microbic agent is specific, as in tuberculosis, diphtheria, syphilis, aphthous stomatitis, and those comparatively rare conditions blastomycosis and actinomycosis. In other infections two organisms may be specific, as the bacillus fusiformis and the spirochæte in Vincent's angina. In these conditions the causative agent can be demonstrated by laboratory examinations.

IMPORTANCE OF CLINICAL LABORATORY EXAMINATIONS.

I have been impressed by the view entertained by many practitioners, when they present cases for diagnosis, that we possess the ability to diagnose the various conditions by means of physical examination alone. Physical examination is of great importance as a means of diagnosis, but such diagnoses are apt to be mistaken. I have seen cases of lues diagnosed as pyorrhea, ulcerative stomatitis, and occasionally as carcinoma; tuberculosis diagnosed as some other infection or malignancy; diphtheria as stomatitis or Vincent's infection, and *vice versa*. Such mistakes were in a way excusable before we had at our disposal the data which enable us to call to our aid clinical laboratory methods.

The fact that a practitioner does not possess laboratory facilities is not a plausible excuse. Every dental or medical practitioner should possess a clinical laboratory outfit, and be so trained as to be able to employ such methods for the proper handling of his cases, or he should call to his aid those who are devoting their energies toward the conducting of clinical laboratories, and who are skilled in this branch.

In many infections we are not dealing with specific causes, the microbic factor varying in different cases presenting like symptoms and like pathologic changes in the tissues. It is manifestly of importance that we determine the nature of the organisms concerned in such conditions. One important example of the latter group is that symptom-complex known as pyorrhea alveolaris. We see cases diagnosed as pyorrhea varying from a simple gingivitis, due to irritation from salivary calculus, to lues, and many cures of as well as failures to cure pyorrhea are due to faulty diagnosis.

THE PROBLEM OF PYORRHEA ALVEOLARIS.

Predisposing factors, as is well known, are of more importance in pyorrhea than in the majority of other oral infections. Frequently this factor is some systemic disease, as diabetes, tuberculosis, nephritis, malaria, or some pre-existing disease which has brought about a marked reduction in the normal resistance of the tissues. Often this predisposition is combined with a local predisposing factor, such as accumulations of salivary and serumal calculus, crowded dentures, a non-vital tooth, improper fillings, and partial artificial dentures so constructed as to constitute an irritant. In other cases the predisposing factor is apparently local.

The microbic agent varies in different cases, and probably to a great extent from time to time in a given case. We have long been searching for a specific agent as the causative factor in this group of infections; but all of our endeavors lead to the view that there is no specific cause for pyorrheal infections,

and the more of these cases I see and examine, the more firmly am I convinced that such is the case.

The endamœba buccalis. Some claim that the endamœba buccalis, first studied in this connection by Dr. Smith and Dr. Barrett, later by Bass and Johns and others, is the specific cause of pyorrhea alveolaris; others, including Dr. Smith and Dr. Barrett, who attribute to this protozoan an etiologic relationship, are more conservative in their views. The question of its relationship to the condition requires further study. I do not feel that we are justified in stating absolutely that it does or does not play a part in the causation of pyorrhea at the present time, but absolutely it must not be considered as constituting the specific cause of this disease. It is true that it is found in a large proportion of cases of the disease. So are spirochætæ and other organisms. It is also true that it is found in a large proportion of so-called normal mouths. Emetin will cause its disappearance, but emetin or any other medication will not bring about a causation of pyorrheal symptoms without elimination of the local predisposing irritants, also elimination or reduction of the influence of general predisposing factors in those cases in which general conditions play a part.

The spirochætæ. In a very large percentage of these cases we find myriads of spirochætæ, and I have been convinced for several years that these organisms play not a little part in the localized destruction of tissue, which is manifestly always essential for the existence of a true pyorrheal infection. Various agents will destroy the spirochætæ, as well as other organisms almost constantly found in this disease. Finely powdered cupric sulfate, iodin solutions, silver iodid, and, as especially anti-spirochætal, salvarsan and neo-salvarsan, have been employed with success when supplemented by careful scaling of the teeth and the elimination of systemic factors.

I am firmly convinced that more real cures would be registered if the dentist were more thorough in his endeavors to eliminate the local irritants. Some are obsessed with the idea that constant work on the dentin is essential. This is a dangerous practice. Scale and clean a tooth thoroughly, then keep instruments away from it and give nature a chance. Continued instrumentation is a source of irritation that we must not ignore. In pyorrheal cases we constantly find and isolate such organisms as the pneumococcus, streptococcus, mucosus capsulatus, various strains of streptococci, the micrococcus salivarius, and less frequently than would be expected, the micrococcus aureus and albus. There are always present, as is readily demonstrated by microscopic examination of the pus, organisms which we have thus far failed to isolate. What their relationship to the disease may be is a question that can only be answered by further study.

Vaccines. It has been stated that the use of vaccines is folly; that they are of no value. Such statements are not worthy of consideration; autogenous vaccines are in many cases of great value in cleaning up a persistent infection. In other cases they are absolutely of no apparent value.

In those cases, and they are not a few, in which organisms have been carried from the local lesion, by the blood stream, to various parts of the economy, vaccine treatment is all-essential.

STOMATITIS.

To enter into a detailed discussion of the various types of stomatitis, while well within the scope of this essay, would consume much more time than we have at our disposal. Stomatitis may or may not be of an infectious nature, but it must be remembered that there is always an excellent chance of any type becoming infected, owing to the fact that the oral cavity constantly contains many types of organisms.

IMPERFECT ROOT-CANAL FILLINGS.

The infections induced by improper sterilization and filling of root-canals are numerous. The importance of great care

in all dental operations is constantly being forcibly impressed on the minds of all who are dealing with large groups of patients. The effects of improper methods are manifest, not only in localized infections around the apex and adjacent tissues, but in subsequent necrosis of the maxilla, and not infrequently in grave general infections.

INJUDICIOUS USE OF HYDROGEN DIOXID.

I have seen so many cases of severe infections following the use of hydrogen dioxid, and still find so many men employing it, that I wish to impress upon those present the necessity of aiding in the reform of those who still persist in using it. Within the past four years I have seen it employed in treating apical and other abscesses; introduced into pyorrheal pockets; injected into suppurating sockets from which abscessed teeth have been extracted. The results of such treatment are extensive local inflammation too frequently followed by necrosis and osteomyelitis, and occasionally a general systemic infection which is often fatal. The use of this preparation in any suppuration other than superficial ulcerations is absolutely contra-indicated.

CAUTION IN THE USE OF ANTISEPTICS IN THE MOUTH.

Before leaving this phase of the subject, I cannot too strongly emphasize the inadvisability of using so-called antiseptics, antiseptic mouth-washes, and antiseptic tooth-powders and pastes. Let us not forget that the majority of agents capable of exerting a detrimental action on bacteria and protozoa are also capable of exerting a like action on the delicate cells which, by their growth, union, and physiologic processes, not only form the structures entering into the make-up of animal or vegetable tissues, but carry on the life processes as well. Physiologic sodium chlorid solution is a valuable and much neglected agent for cleansing the oral cavity in both normal and abnormal states.

The use of germicidal agents is manifestly of great value as a local therapeutic measure in dealing with many oral infections; not only is their action of importance as exerted upon organisms present, but frequently it is desirable to induce a local stimulation or destruction of pathologic tissues. The subjection of the tisues of the entire oral cavity, however, to such agents, is to be condemned.

SYSTEMIC DISEASE DUE TO LOCAL ORAL INFECTION.

One question of vital interest to the dental as well as to the medical practitioner is that of the great importance of localized oral infections as factors in general infections and others in remote parts of the economy. This subject is being studied extensively at the present time, and as our knowledge concerning these interrelations advances, their importance becomes more manifest. Septicemia and pyemia frequently have their origin in local oral infections; arthritis and so-called rheumatic conditions are in many instances due to the action of organisms absorbed from the tissues of the oral cavity and fauces. There is a great field for the dental practitioner in the treatment of these cases, as unless the local condition is eliminated, we cannot expect to cure the general disease.

Investigations have been made showing an etiologic relationship between primary oral infections, gastric duodenal ulcers, appendicitis, hepatic disease, and other remote conditions. Further work is now in progress. Such studies are worthy of all consideration. If this connection be a fact, it is one of great importance—and, viewing it from our knowledge of infectious processes, the relationship appears rational.

CONCLUSIONS.

In closing this somewhat wandering discourse, I ask all of you to carry home as food for thought and practice the fact that the dental practitioner of the future must concentrate his endeavors more fully and carefully along the lines of

preventive medicine, as the majority of conditions which he is called upon to treat are either infections or the result of infectious processes. Even dental caries must be looked upon as being to a great extent due to bacterial action and therefore an infection, and undoubtedly preventable. The man who looks upon the study of pathology, including pathologic microbiology, as a refinement instead of an essential, is a detriment rather than an asset to the profession. We are working on human beings, and the best interests of the human race should always, to professional men, be the first consideration.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

A SYSTEM OF MAKING JACKET PORCELAIN CROWNS WITHOUT FUSING.

By L. E. CUSTER, A.M., D.D.S., Dayton, Ohio.

(Read before the Pennsylvania State Dental Society, at its annual meeting. Reading, June 22, 1915.)

TWENTY-NINE years ago, Dr. C. H. Land of Detroit introduced the first porcelain jacket crown to the dental profession. This followed closely in the wake of the porcelain inlay. At that time the gas furnace was used for fusing porcelain, but owing to the bulk, dirt, noise, and the danger of "gassing," only a few dentists took up the work. When, nine years later, the electric oven was introduced, dental ceramics received a fresh impulse and was taken up in one form or other by nearly all progressive dentists. But even to this day the porcelain jacket crown, owing to the high degree of skill and patience required, is only employed by a select few. This crown, however, has certain advantages possessed by no other form of crown, which should bring it into more general use, and the message I wish to convey is a system whereby the country dentist, the dentist who has no electric current at his disposal, or a dentist who has not taken up dental ceramics, can, with the ordinary dental outfit, make a jacket crown which is practically as good, and indeed better in some respects than one baked by the dentist himself.

ADVANTAGES OF THE PORCELAIN JACKET CROWN.

The jacket crown possesses certain features which easily place it at the head of all other forms of porcelain crowns. First, the strength and durability of this crown is testified to by every dentist who has made one. Dr. W. A. Capon of Philadelphia says, "After many years of experience with different kinds of porcelain jacket crowns, I am glad that I was fortunate enough to recognize their efficiency early in my practice. When a root has been crowned to death and considered only fit for extraction, a jacket crown will give it renewed life and vigor in the majority of cases, if it is decently firm in its socket."

Dr. Edward B. Spalding of Detroit says, "The all-porcelain jacket crown and its modifications have displaced all other forms of porcelain crowns in my practice. The gum tissue is always more healthy about a carefully fitted and flush joint than where a band is used."

Dr. George Schneider of Chicago says, "There are two vital points in favor of the jacket crown, namely, first it is not

necessary to remove the natural crown in whole; second, you do not endanger the root by enlarging the canal for the retention of a post."

Dr. H. E. Jenkins of Ironton, Ohio, whom I have seen repeatedly drive a canine jacket crown of his own make through an inch pine board without damage to the crown, maintains and proves that it possesses strength above any other form of porcelain crown.

The strength of the jacket crown is due largely to the natural post of dentin within it, which is a part of the tooth itself. Where caries has left but little dentin, this is reinforced by a platino-iridium post occupying approximately the pulpal space of the tooth. We have never seen or heard of a root split under a jacket crown. This cannot be said of any other form of porcelain crown.

A second advantage of the jacket crown, as pointed out by Dr. Spalding, is that it makes a flush joint with the root at the cervix. A metal band with its uncertain fit is thus done away with.

The third advantage is the esthetic appearance of the completed crown. The entire crown itself performs the functions of a band, thus eliminating the unsightly metal band at the gum line.

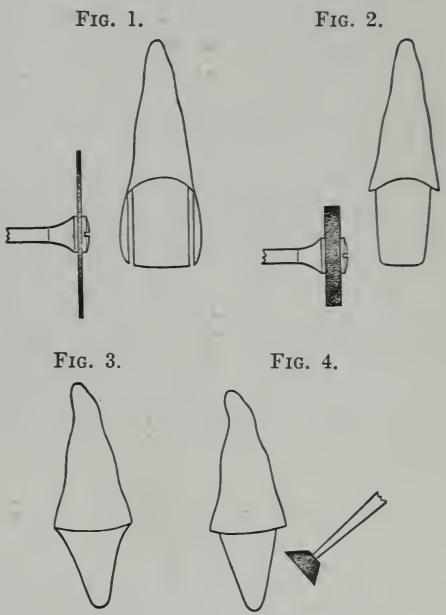
OBJECTIONS.

The disadvantages of the jacket crown lie entirely in the technique of its construction. The operator must be skilled in the working of porcelain, and I know of no procedure in dentistry that requires so high a degree of skill and patience as the making of a porcelain jacket crown. The platinum coping requires skill and time in its formation, the selection and fusing of the proper shade of porcelain requires years of experience, and then often at the last minute the esthetic appearance of the whole appliance may be spoiled by overfusing. Another objection is the amount of time consumed in the baking method.

It is a system or procedure in which the objections just enumerated are overcome that I herewith present, and since I am the inventor of the first electric oven, it may seem strange that I advocate a method which does not require an oven, nor does it require any special instruments. It will also be noticed that many steps of the technique are old and more or less familiar to everyone.

PREPARATION OF THE TOOTH.

The first step is the preparation of the tooth, the technique of which is practically the same as for a baked crown and quite simple, seldom requiring more than fifteen minutes. With a carborundum disk the sides of the tooth are cut off as shown in Fig. 1. Then, with a wheel, the end of enamel is removed approximately to the dentin, as shown in Fig. 2.



The end should not be removed first, for it requires more grinding. Then, with the same or a smaller wheel the enamel is removed both labially and lingually, and the corners are rounded as shown in Fig. 3. The fourth step consists in squaring the shoulder just under the gum line, which is done with a small bell-shaped carborundum point, as seen in Fig. 4. The final dressing is done

with a flexible sandpaper disk and point as shown in Fig. 4, for the corners.

SELECTION AND PREPARATION OF CROWN.

A pinless crown of any make and of the size and color suitable for the case is now selected. The inside is hollowed out with small carborundum or diamond points, which operation requires about fifteen minutes. This, however, can be done by the assistant. I have myself bought a selection of biscuited crowns, hollowed them out with a large bur, and returned them to the manufacturer for final baking. I am told that if this procedure is taken up to any extent, ready-made jacket crowns will be put upon the market, thus saving the grinding-out of the crown.

The hollowed-out crown is now filled with soft, black wax, such as is used for carding teeth, warmed, and placed upon the stump of dentin. If the crown is dry and the stump wet, the wax will remain in the crown, and upon removal will show just where grinding will be necessary for a closer fit. This manipulation is repeated until the labial surface of the cervix of the crown passes under the gum margin.

SEALING OF THE JOINT BETWEEN CROWN AND ROOT.

We now come to the secret of the entire procedure, that is, the perfect sealing of the joint at the cervix between the crown and the root. Ney & Co. furnish a platinum and gold foil, equal parts, beaten down to a No. 10 foil. If the joint is fairly well fitted, without any space wider than thin pasteboard, a piece of this foil about one inch square for a lateral incisor, and larger for a central or cuspid, is crumpled into a rope. The ends are cut on the bias which, when brought together around the stump of the tooth, will overlap, and if annealed will cohere and facilitate manipulation. The crown is then put in place over the rope with firm pressure and light malleting. While the crown is held in place, a thin burnisher is passed entirely around the bulging washer, and the gold is condensed against and into the joint. The gold-and-platinum rope now forms a washer which perfectly fits the root on one side and the crown on the other. It is then removed, and placed in an investment of carborundum and alcohol in a small fire-clay cup.

CARBORUNDUM AS AN INVESTMENT MATERIAL.

I here call attention, perhaps for the first time, to the use of carborundum such as is used in grinding automobile valves as an investment material in dentistry, because of its infusibility and high specific gravity. The carborundum packs closely around the washer, forming a firm support, and to some extent prevents warping of the metal. Although infusible, it appears to cohere when at a high heat, for a little difficulty is experienced in getting the washer out and breaking up the carborundum. It is far superior to silex when used for similar purposes, and may be used over and over again.

The washer is now placed in the investment at a slight angle, and by gentle tapping on the tray is allowed to settle until entirely embedded, excepting the lap joint. A small piece of coin gold, well boraxed with a saturated solution of borax and boracic acid, is placed on the exposed lap. The alcohol is burned off and a flame is directed at the cup from *below*, the object of this procedure being that, when the solder melts, the washer being hotter than the solder, the latter will be immediately drawn into and fill the washer. There will be no danger of melting the washer even when coin gold is used to solidify the same. This is because of the high percentage of platinum in the foil. In my first experiments I tried pure gold foil with a low-karat solder, but found the foil to be always warped and melted in the thin places even when as low as 10-karat solder was used.

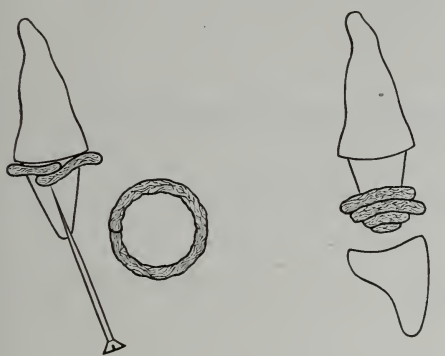
CEMENTING JACKET CROWN TO PLACE.

We now have a washer of high karat which fits the root on one side and the

crown on the other. It is dressed on its periphery so as to be flush with the root and crown. The crown and washer are now to be set, and, for this purpose I wish to recommend the use of Tenacit, a translucent cement made by DeTrey Bros. for crown and bridge work. We are all aware that the silicious cements resist chemical action in gingival positions better than the oxyphosphate cements. This material, moreover, produces no shadow effects as does cement under thin porcelain. Tenacit adds to the lifelike appearance of the crown.

In order to prevent weeping of the gum tissue and secure perfect dryness, the gum is touched with a 20 per cent. solution of trichloracetic acid. This is a powerful astringent, and its effect will last amply long enough to remove the surplus Tenacit and cover with varnish.

FIG. 5. FIG. 6.



SECURING JOINT IN BADLY CARIOUS ROOTS.

The procedure just recited applies to those cases where the carious process has not extended beyond the gum margin, but in those cases where it has gone beyond the gum line to any extent at any one point, the metal washer must be thickened at that place. If the caries is not too deep, the ends of the rope need not be cut on the bias, but may simply overlap, which will give a double thickness at this point. In order to insure the coin-gold solder permeating between the different folds of the foil, three or four punctures at the lap are made with an ordinary pin or sharp-pointed instrument, as seen in Fig. 5. When the decay is quite deep, extra pieces of foil are built up at this point, as shown in Fig. 6.

ADVANTAGES OF WRITER'S METHOD.

A crown made in the foregoing manner is, to my mind, in regard to security of attachment and seal against future decay, not only equal to a crown fused by the operator, but has four distinct advantages: (1) The selection of color is absolutely assured at the very outset. No vagaries of the fusing process enter into the final shade. The operator knows at once what the final appearance will be. Moreover, there will be no change of color in the future, as appears to take place in office-baked porcelain. While this is more frequently seen with inlays, largely owing to the fact that difference of color is more noticeable in contiguous surfaces, still it takes place to some extent in office-baked jacket crowns. There appears to be a bleaching effect in the course of time. Factory-baked porcelain does not apparently change color. (2) The porcelain of a factory-baked crown is stronger than that made by the dentist, because the porcelain is condensed under considerable pressure, and is more evenly tempered when cooling. (3) While the crown may not fit as perfectly on the inside to the stump of dentin, depending upon how much time the operator devotes to this step, a closer sealing at the gum line, the *essential* step, is achieved by the metal washer than by a porcelain crown after the platinum coping has been stripped from within. The fit on the inside depends upon the amount of time the operator gives to this step, but in practice, the inside fit, when the crown is set with Tenacit, is quite immaterial. (4) A great saving in time is effected, for the entire operation seldom requires more than an hour for its completion.

FURTHER APPLICATIONS OF THE GASKET METHOD.

Any thoughtful operator can easily see the application of the gasket method

of cervical sealing to Logan and other fixed pin crowns (see Fig. 7), and he can also, by this method, as I have often done, make the washer perform the function of an intradental ring by cutting a groove in the end of the root half-way between the root-canal and the periphery. Moreover, by using a thicker rope of gold and one which is somewhat larger in diameter so as to bulge more at the joint, the bulging portion can be burnished so as to form a perfectly fitting band around the end of the root or crown, or both at the same time. Such a washer, when it is removed and each side is filled with plumbago paste, can be thickened to any extent with coin gold. This application is shown in Fig. 8.

Fig. 7.

Fig. 8.

While it might seem to some that, if the thought of this paper were carried out, the highest grade of dental ceramic art would deteriorate, I have no such fears, for those who have become skilled in the making of jacket crowns will continue to do so, but the way is pointed out how any dentist, with a simple office equipment, may render the best service to a patient when a porcelain crown becomes necessary.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

THE RELATION OF DENTISTRY TO NEUROLOGY.

By CHRISTOPHER C. BELING, M.D., Newark, N. J.

(Read before the New Jersey State Dental Society, at its annual meeting, Asbury Park, July 21, 1915.)

MANY nervous affections are dependent on disease of the teeth. Until recently they have not been sufficiently recognized, and our knowledge concerning their relationship is still incomplete.

A large group of these affections are reflex in character. They commonly arise as the result of irritation of one or more of the dental nerves producing an alteration of function in some other portion of the nervous system.

REFLEX PHENOMENA AND THE DENTAL AFFECTIONS CAUSING THEM.

The reflex phenomena dependent on affections of the teeth are pain, tonic muscular contractions, muscular paralyses, and involvement of some of the cranial and sympathetic nerves. They may follow caries with or without exposure of the pulp, plastic or suppurative periosteitis, impaction of the permanent teeth in the maxillary bones, the overcrowding of teeth from lack of room, exostoses, hypertrophy of the crusta petrosa, and nodular growths of dentin in the pulp cavity or in the root-canals.

Pain is the most frequent of these reflex phenomena. As its prompt alleviation is sought from the dental surgeon or the physician, a clear understanding of the causes producing it are vital for both. As we all know, toothache is due to an irritation of one of the branches of the trigeminal nerve. The pain is at

first more or less localized to the point of origin, and may gradually spread and give rise to a neuralgia of the entire side of the face and even extend to the head, neck, shoulder, and arm. Why this occurs soon becomes evident when it is recalled how extensively the trigeminus anastomoses with the cervical nerves and the sympathetic nervous system.

Small excrescences of dentin occurring within the pulp cavity, dental stones in the substance of the pulp, or fine nodular exostoses on the roots of teeth may all produce pain in the dental nerves; from the focus of irritation, it is soon spread over a wide area. In these cases, which are not altogether uncommon, medical treatment is often hopelessly applied for a long time, when the diagnosis may be made by the radiologist, and the remedy applied by extraction of the offending tooth.

Metal fillings in teeth often impinge on the pulp and cause severe neuralgias that are hard to locate. If dental surgeons would be particularly careful to line the cavity with cement or other nonconducting substance, many of these painful nerve conditions would not occur. They would thus obviate the distressing pain that nature tries to overcome by stimulation of the production of cementum over the point of irritation.

The teeth often become hypersensitive and ache from a variety of causes. Destruction of the enamel and involvement of the dentin give rise to sharp local pain, which is particularly accentuated under the influence of heat and cold. When the pulp cavity becomes involved, the pain is then referred to some other region. After the destruction of the pulp the referred pains cease, and local pains from periodontal involvement take their place.

NEURALGIC PAINS AND REFERENCE AREAS IN RELATION TO THE TOOTH INVOLVED.

Neuralgic pains resulting from extension of caries into the pulp cavity seem to have definite areas of reference in relation to the tooth involved. These areas have been demonstrated by Dr. Henry Head. According to him, "Each organ in the head stands in relation with one or more areas on the surface." They do not correspond to the distribution of the branches of the trigeminal nerve, and are extremely sensitive to touch, heat, and cold. They are ascertained by touching the skin of the face by any blunt point and marking the limits of tenderness and sensitiveness to pain. Over areas involving loose tissue, as the lower part of the chin and neck, the limits of tenderness are ascertained by gently pinching the loose skin. There are "maximum spots" of pain in these areas, which the patient can localize. When the maximum spot is touched, there is often distinct exacerbation of pain from the tooth.

The tender area is only developed after the neuralgic pain has lasted several hours and disappears within twenty-four hours after the diseased tooth is extracted.

The following table taken from Behan's book on "Pain" shows the relation of these reference areas to the teeth. For detailed information, Dr. Head's original work published in *Brain* (1904) should be consulted.

TOOTH.	REFERENCE AREA.
Upper jaw.	
1. Incisors.	Fronto-nasal region.
2. Canine.	Naso-labial region.
3. First bicuspid.	" "
4. Second "	Temp'l or maxillary.
5. First molar.	Maxillary region.
6. Second "	Mandibular "
7. Third "	" "
Lower jaw.	
8. Incisors.	Mental.
9. Canine.	"
10. First Bicuspid.	"
11. Second "	Hyoid or mental.
12. First molars.	" also in ear and just behind angle of jaw.
13. Second "	Tip of tongue same side is tender.
14. Third "	Superior laryngeal area.

PAIN ERRONEOUSLY ATTRIBUTED TO DENTAL CARIES.

Neuralgic pain in the head, face, and neck arises from many causes which are

not of local dental origin. Among these are certain constitutional disorders, such as anemia, gout, diabetes, malaria, and influenza. "Central trigeminus pain—tic douloureux—either from involvement of the ganglion itself or its internal roots, or as a result of pressure (cerebello-pontile angle tumor, neuroma), often leads to a faulty diagnosis of tooth pains. Many patients suffer from the loss of one tooth after another in vain search of the affected one. After the sacrifice of the teeth the dentist or the physician wakes up to the fact that the disorder is central, and that a grave mistake has been made."

Locomotor ataxia not infrequently gives rise to pains which might be mistaken for those of dental origin. Certain symptoms of this disease are easily recognizable, and may serve to prevent an error in diagnosis. The dental surgeon may readily learn to observe the loss of the pupillary light-reflex, inequalities and irregularities of the pupils, anesthesia of the face, loss of the knee reflexes, and the disturbance of equilibrium.

INFLUENCE OF PRESSURE IN DISGUISING PAIN.

Among the physical factors modifying pain, pressure is by far the most important. In many instances it is the underlying factor of pain production.

Recently there have been statements made by certain members of the dental profession regarding the production of analgesia in the teeth by continued pressure exerted at some distant part of the body, particularly the fingers. This method has been used, as I understand, for the production of analgesia for dental operations. As far as I am aware, no such neural relation of a reflex character has been demonstrated by any competent neurologist.

The so-called deadening effect has to be explained along an entirely different line. The factors modifying the production of pain are psychical and physical. The psychical factors are connected with emotion, consciousness, suggestion, diversion of attention, and expectation of pain. "Pain may often be eased by concentration upon some other object, or by self-persuasion (auto-suggestion) that pain is not present. Diversion of attention is important. When a patient's attention is drawn to some object and he is entirely engrossed with it, he has two centers (sensory) which are active, as a consequence of which neither is apt to be as sensitive as if acting alone." Thus pressure exerted on the fingers diverts the attention of the patient, and the sensory stimulation of the tooth is not felt so keenly and recognized as pain.

MUSCULAR CONDITIONS ASSOCIATED WITH DENTAL DISEASE.

Associated with disease of the teeth are certain muscular conditions. These are either of reflex origin, or due to indirect irritation from the absorption of toxins. As a result of irritation of the dental nerves, the facial muscles may be thrown into a state of reflex tonic contraction. These muscular spasms generally subside when the source of reflex dental irritation is removed. If long continued, changes take place in them leading to a more or less chronic hypertonus, with which are associated occasional vague facial pains. The facial muscles may also be indirectly affected through the absorption of toxins from septic foci in the teeth and their irritant action upon the connective tissue elements.

As a result of fibrous hyperplasia, the delicate nerve-muscular mechanisms are pressed upon, pain is produced, and the muscle tone is increased. With systemic infection this condition of fibro-myositis or fibrositis may spread to the other parts of the body, and give rise to aches and pains of a more or less intense character. While they may be readily relieved by local and general treatment, they are apt to recur from time to time, if the exciting cause is not removed.

Time will not permit me to take up the consideration of other reflex disturbances arising from the teeth.

DIRECT INVOLVEMENT OF CRANIAL NERVES.

Another group of disorders are those dependent upon direct involvement of some of the cranial nerves. Inflammatory lesions caused by diseased teeth may involve the motor facial nerve, the orbital nerves, and the trigeminal. In affections of these nerves, dental disease must be borne in mind as an etiological factor.

DENTAL MANIFESTATIONS OF SYPHILIS.

Some of the manifestations of syphilis, which come under the observation of the neurologist, are also of interest to the dental surgeon. In congenital syphilis the teeth are deformed and present certain characteristic appearances, which have been described by Jonathan Hutchinson. They are peg-shaped, stunted in length and breadth, narrower at the cutting edge than at the root, with well-formed enamel on the anterior surface and a notch at the cutting edge. According to Fournier and Darier, the first permanent molars show an imperfect formation of enamel on the crowns and a growth of the softer dentin into irregular projections. On account of this, these teeth decay very early. As they appear before the permanent incisors, they may furnish a valuable help to diagnosis.

In the later stages of syphilis, and particularly in tabes dorsalis, the alveoli and the jaws may deform rapidly, and the teeth fall out. During these changes, the fitting of dentures proves unsatisfactory. This is another reason why the dental surgeon will find it to his advantage to learn to recognize the disease from the cardinal symptoms, which have already been given in this paper.

CASES OF OCCUPATIONAL INFLUENCES UPON THE TEETH.

In an industrial city like Newark one often sees peculiar gross appearances of the teeth, due, no doubt, to occupational influences. Workers exposed to the effects of mercury and arsenic are more prone to suffer from putrefactions of the gums, which induce pyorrhea and oral sepsis.

Copper. A man of fifty-eight years of age, who had been a worker in copper for twenty-nine years, was recently sent to me by his physician. He was suffering from mental depression and neurasthenic symptoms, occasional glycosuria and visceroptosis. There was a heavy, lustrous deposit of a greenish brown color on his teeth, but no evidence of sepsis, caries, or recession of the gums. He had never taken any care of his teeth. In his case it is reasonable to conclude that the copper salts had a prophylactic influence against the occurrence of caries and oral sepsis. This also emphasizes the fact, well recognized by the dental profession, that copper amalgam has a benecial and preservative action in the prevention of dental caries.

Mercury. As a striking contrast, I shall cite the case of a patient whom I recently saw in consultation with Dr. Brien of Orange. A strong, well-built man, of German birth, forty-nine years of age, had worked as a hatter for twenty-two years, and had been exposed to the influence of mercury. He had always been well, except for occasional gastro-intestinal disturbances. During the past four or five months he had complained of pain in his joints and neuralgic pains diffused all over his body. For about two months the right shoulder was quite painful and stiff. On the day of examination he complained of severe, paroxysmal pain in the head, so intense that he thought he would lose his mind. His skin was cold, pale, and bathed in a profuse perspiration. There was exquisite pain and tenderness at the insertion of the right sterno-mastoid, which was in tonic spasm. The right buccinator muscle was strongly contracted and painful. There was tenderness over the liver, creaking of the large joints, changes in the terminal joints of the fingers, and painful induration around the right sacro-iliac joint. No clinical evidences of brain or meningeal disease were present. The pupils and re-

flexes were normal. The tongue was heavily coated, the flow of saliva increased, the gums were swollen, tender, covered with pus and bleeding readily. Pyorrhea was marked, caries slight. The etiology and indications for treatment were apparent.

NERVOUS AFFECTIONS ASCRIBED TO DENTITION.

Many nervous affections have been ascribed to effects of dentition, particularly diseases of the brain and of the meninges. The fact that painful dentition is associated with these and other diseases does not warrant the conclusion that there is any immediate causal relation. Dentition itself is a physiological process, and should occur without any disturbance to health. It is, however, often associated with pain and inflammation of the gums and constitutional disturbance. "The mouth, teeth, and gums are a part of the alimentary tract, and they share in the general disturbance caused by indigestible and toxic material in the gastro-intestinal tract." Teething becomes of importance when it occurs through inflamed gums. Gastric and intestinal disturbances are far more potent causes of infantile convulsions. It should also be borne in mind that children who are neurotic and unstable by inheritance are especially liable to convulsions.

Physicians are prone to place too much stress upon dentition as a cause of nervous disorders. There are many who still cling to some theory by which they may explain a causal relation. Some claim that reflex effects conveyed through the trigeminal nerve which supplies the jaws and teeth are responsible; others declare that dentition produces high temperature and consequent chill with catarrhal and inflammatory sequelæ; and still others believe that during the period of dentition there is a condition of exceptional susceptibility to various complaints and of general nervous instability, which may be responsible for the illnesses.

EFFECTS OF THE DUCTLESS GLANDS UPON THE DENTAL ORGANS.

The medical profession today fully recognizes the importance of disorders of the internal glandular secretory organs in their effect upon the growth, development, and integrity of the human body. They must also be of interest to the dental profession. As a result of disturbance of their functions, the teeth may erupt slowly, the gums may become spongy and bleed readily, their vitality diminish, and the soil be prepared for the reception of pathogenic micro-organisms. Sajous says, "Impairment of the functions of the thymus and of the adrenals underlies the disorders of nutrition which inhibit the development of the cerebro-spinal, nervous, and osseous systems during infancy, childhood, and adolescence."

HYPOTHYROIDISM.

There is a condition which not infrequently occurs in children as the result of a failure of the secretion of the thyroid gland. It is characterized by subnormal temperature, impairment of nutrition, dryness of the skin, thinness and coarseness of the hair, and at times even its absence, brittleness and striation of the nails, and retardation of brain development. In this condition both the first and second dentitions are delayed, and the teeth are generally deficient in calcium salts or other chemical constituents. For its correction, the deficiency of the thyroid secretion must be supplied by a careful course of feeding of the extract of the gland taken from the sheep or other animals. Valuable time is lost in waiting for improvement to take place in the natural course of development. Such treatment will work a marvelous change in a comparatively short time.

NERVOUS DISORDERS DUE TO ORAL SEPSIS.

An increasingly large group of cases of interest to the medical profession de-

pend upon the remote effects of oral sepsis. Of direct neurological interest are affections of the neuro-muscular apparatus, neuralgia, neuritis, neurasthenia, and some diseases of the central nervous system. Alveolo-dental pyorrhea, like syphilis, is a common disease. Every syphilitic does not become a tabetic or a paretic, nor does every possessor of a septic mouth develop a constitutional disease. The potentiality of great mischief, however, is present in both. No doubt the predisposing factors in the one case are as hard to discover as in the other.

CO-OPERATION BETWEEN DENTIST AND PHYSICIAN URGED.

It is in this group of cases particularly that a great responsibility rests upon the dental surgeon as well as upon the physician. As Dr. Byron C. Darling has forcibly stated in the conclusions of his paper on "Oral Osteitis in Relation to Arthritis," read before the Central Dental Association of Northern New Jersey, April 20, 1914: "As a first rather than as a last resort, special attention must be paid to the condition of the teeth. Much old and unscientific dentistry, such as bad crown and bridge work and root-fillings that are not scientific, must be removed, and the conditions remaining properly treated; failing this, merciless extraction and false teeth, but a clean mouth. Pyorrhea alveolaris is a menace to good health; it is a chronic ulcer of the gum, and finally of the bone, and assuredly a focus of infection. There should be co-operation with mutual recognition of responsibility between the physician and dentist."

DENTAL FATIGUE. POST-OPERATIVE SHOCK.

In conclusion, may I call attention to a condition of nervous exhaustion which may follow dental operative procedures in the same way as it does general surgical operations. It is known to your profession as dental fatigue. As a matter of fact, it is nothing more than shock, and is dependent upon traumatic and emotional stimuli acting upon the kinetic system, which is composed of a group of organs among which are the brain, the thyroid, the suprarenals, the liver, and the muscles. As Crile has stated, "If the stimuli are overwhelmingly intense, then the kinetic system—especially the brain—is exhausted, even permanently injured. Noci-stimuli are of two kinds, traumatic and psychic. To prevent them not only must the infliction of pain be minimized, but also anxiety and distress must be removed."

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

CORRESPONDENCE.

ADVANCE NOTICE OF THE USE OF THE FLUID EXTRACTS OF UMCKALOABO AND CHIJITSE IN THE TREATMENT OF PYORRHEA ALVEOLARIS.

To the Editor of the Dental Cosmos:

Sir,—My attention was called to these drugs by a man reported to have been cured of pulmonary tuberculosis through their use while traveling in South America, where an infusion made from these herbs is employed by the natives as a specific for all diseases of an infectious character.

Umckaloabo and *Chijitse* are drugs unknown to the U. S. Pharmacopeia or to those of France or England. I have not been able to find that they contain any known alkaloid. They are nontoxic.

I found that a 5 per cent. solution of the tincture of umckaloabo and chijitse was a bactericide and would inhibit the growth of bacteria obtained from a pyorrhetic pocket of a patient who displayed all the clinical evidence of pyorrhea alveolaris. Cultures made from these pockets showed a mixed character of a pyogenic variety. A 10 per cent. solution of the tincture destroyed the life of these organisms in ten minutes.

When pyorrhea pockets were irrigated daily with a 10 per cent. solution of the tincture of umckaloabo and chijitse, they showed marked curative reaction with a gradual diminution of pus.

It has since been used satisfactorily in several other cases.

Mr. Frank, superintendent of Beth Israel Hospital, N. Y., informed me it had passed satisfactory laboratory tests at that institution. Dr. M. Wm. McDuffie, N. Y., director of the Society of Medical Research, states that he has employed it in several cases of phthisis, and recommends its use. Dr. B. Lenox Curtis of New York makes similar reports.

This is what I know of the tincture of umckaloabo and chijitse. I do not believe it will eliminate scaling; any deposits upon roots predispose them to pyorrhea. However, in conjunction with surgical treatment, umckaloabo and chijitse is a valuable attribute.

H. J. Kauffer, D.D.S.

112 West 72d st., N. Y., October 9, 1915.

PROCEEDINGS OF SOCIETIES.

PENNSYLVANIA STATE DENTAL SOCIETY.

Forty-seventh Annual Meeting, held at Reading, Pa., June 22, 23, and 24, 1915.

TUESDAY—*Morning Session.*

THE forty-seventh annual meeting of the Pennsylvania State Dental Society was called to order on Tuesday morning, June 22, 1915, at 10.30 o'clock, in Rajah Temple, Reading, by the president, Dr. James G. Lane, Philadelphia.

Rev. NATHAN R. MELHORN, Reading, invoked the divine blessing on the deliberations of the association.

WELLINGTON M. BERTOLET, Esq., city solicitor of Reading, welcomed the society to Reading, as follows:

ADDRESS OF WELCOME.

I am glad to welcome the members of the Pennsylvania State Dental Society to the City of Reading. Were it not for the secure pre-eminence in the dental world attained by that suburb of ours, Philadelphia, I am quite sure that Reading would be the leader of your profession in Pennsylvania. However that may be, we can all agree that the Keystone State, because of the magnificent work done by the University of Pennsylvania, leads not only this country but the whole world in the science and practice of dentistry, and that celebrated Castalia of oral hygiene and surgery is suburban to Reading on the south, waiting to be annexed.

I might take a lot of your valuable time by telling you of the greatness of and the pleasures to be found in Reading, but I know very well that your own observation, directed by your local committees, will take care of that. Rather would I bring to your attention the layman's viewpoint of the public service open to your profession. We know more than ever before about teeth and their relation to the working of body and mind, not because of our aches and pains and fillings and pulls, but because a certain group of your profession has by generous public service brought home to us that the care of the teeth is a material factor in physical and mental, not to mention esthetic efficiency. In this public service, it is with great pride that I tell you that the Reading Dental Society is Pennsylvania's pioneer. About six years ago, Dean Kirk came to Reading and opened the eyes of our school teachers to the dental disabilities of school children, and the Reading Dental Society has kept them opened ever since. Without cost to the public the society examined 8925 pupils the first year, and you can guess the deplorable findings. Three per cent. had perfect teeth; one-half had never used a tooth-brush; only one in six had ever been to a dentist; 28,548 cavities in permanent and 14,707 in temporary teeth were found. These results were brought home to parents, and hundreds of children went to the dentist for treatment, and the good men of the society freely treated hundreds more who could not afford to pay.

This work, begun six years ago, is going on today. Our D.D.S.'s are real doctors, that is, teachers, and they share in the effort to uplift our community life.

I do not know what your profession calls such work, but we laymen of Reading who know about it call it noble public service.

Business men who want healthy employees with good digestion, parents who want their children to avoid the aches and pains of putrescent and exposed pulps, school authorities who want pupils to advance normally, must see that the tooth-brush gets more than a "50-50" chance. Public realization of these facts will not be gained from the individual dentist, but from meetings such as this, which bring before the people the direct and vital relation between health, growth, and ability to work efficiently on the one hand, and oral hygiene and dental surgery on the other.

Dr. H. E. Friesell, Pittsburgh, responded to the address of welcome on behalf of the society, as follows:

Response to Address of Welcome.

I appreciate the honor which has been conferred upon me in being selected to respond to the address of welcome. It certainly is a pleasure to represent the Pennsylvania State Dental Society in responding to the courteous address of welcome to which you have listened. One might think from the present audience that the Pennsylvania State Dental Society was a delegate body, but I can assure you that at the later sessions we will have many members present who now appear to be absent. The society has a membership of something over twelve hundred, and while we agree with you in many of the sentiments you have expressed in regard to Reading's suburbs, like Philadelphia and Pittsburgh, we do not agree with your ideas in one respect, and that is that there is any sectionalism in dentistry in Pennsylvania. This society is evidence of that fact. All the recent advancements in dentistry in this state in the past ten years have been made at the instigation of this State Society. We are glad that the citizens of Reading are beginning to appreciate the fact that many disease conditions come from the lack of care of the mouth. We thank you for your kindly words of welcome, and trust that the work of the society, while in your city, will be such as will meet with your approval.

Dr. Friesell, vice-president, was called to the chair, and Dr. Lane read his annual address to the society, as follows:

President's Address.

By James G. Lane, D.D.S.

The Pennsylvania State Dental Society has rounded another year of its existence, and we have assembled at this time to enact the program of the forty-seventh annual meeting. Last year, when we looked forward to this time and thought of this meeting, the time seemed far distant. Now, as we look back over the period of time that has elapsed since our last meeting, it seems but a brief yesterday. The retrospect thus reminds us that what we call time is very elusive, and for real efficiency it must be utilized in its entirety and without procrastination. We believe this has been done during the past year.

Dental Legislation. Annual Registration.

The achievements attained since our last meeting are most gratifying. We feel that a great step has been taken, forward. The Legislative Committee appointed by your president at the close of last year's meeting lost no time in prosecuting the work assigned, and today we can feel justly proud of what has been accomplished by that body. Our state dental law that was in force immediately preceding the recent amendments was indeed a good one; when enacted it was the best of its kind, but a few years of advancement and experience taught the lesson that the "kind" was no longer efficient as a means toward an end. Therefore a revision was needed, and such revision has been accomplished, as you have all read in the *Bulletin* just issued. We regard the

legislation that requires annual registration, with a small fee accompanying it, as a great factor in advance in our state. Quite several other states have had annual registration for some time, and their experience has proved such legislation to be eminently satisfactory. Annual registration is efficient not only because it enables the state to have a complete record to date each year of all dentists in the state, but it also serves the purpose of providing for the care of illegal practitioners in the way it should be done. In this age of enlightened and scientific advancement no allowance or sympathy is due the charlatan. The proper handling of such personages is now a duty of the State of Pennsylvania through the medium of the Pennsylvania State Dental Examining Board, and not through the medium of the State Dental Society as heretofore.

FOUR YEARS' COLLEGE COURSE.

The importance of the recent amendment requiring applicants for licensure by the State Dental Examining Board to have had a four years' course of training cannot be over-estimated. Those who are in touch with college conditions know full well what it has meant to the recent graduate in dentistry to qualify in accordance with the present demands. It seems but a few years since the course of training for dentists consisted in but two academic years of seven months each, then a little later, eight and a half months each; still later, three years of eight and a half months each. The advancement of dental science has been such that it is no longer possible to teach the full quota of that science to date in three academic years; hence a fourth year has been added. The attempt made by the colleges a few years ago to bring about a four years' course was very much to the point, but it was ill-advised in that it placed the cart before the horse. It could not and did not succeed. The present legislation presents the authority from exactly the right body—the State of Pennsylvania. The dental colleges have therefore only to fall in line. We are justly in position to shout, "Hail Pennsylvania!" for Pennsylvania is the first state in our Union to pass legislation requiring applicants for licensure to have had a four years' course of training. Pennsylvania has thus stepped forward and blazed the trail which the other states will sooner or later surely have to follow.

MEMBERSHIP AND COUNCILS.

Let us briefly reminisce over a few years. We recall the memorable meeting of 1908, up to which time our society had developed into a peculiar state of bondage, a bondage of dental politics, —because of which it had not grown or developed as it should have done. Indeed, growth had ceased entirely. At that time machinery was devised and put into action for creating a Greater Pennsylvania State Dental Society, a society that would really represent the profession of our state, one that would be truly representative. Some predicted failure; others said, "We'll try." Just what has been accomplished may be noted by the fact that in the then ensuing seven years the representation of our State Society had increased about 435 per cent. This was accomplished only by earnest effort, and is an index of what can be done; also an index as to the quality of material that can be produced from the dental profession of our state.

While we may feel justly proud of the trend of events and accomplishments of the last few years, we are cognizant of the fact that much yet remains undone; much which *must* be done if we would realize the full advantage of a well-organized body. Really the work has only nicely started, and much missionary effort must yet be put forth in order to accomplish what is needed. This missionary work must be done by the component societies and directed by the State Society. Under the present *régime* the bond of union between the parent society and its component parts is not sufficiently close.

We therefore recommend that each

component society shall elect, at its annual election, one of its members to become, by virtue of such election, a member of the Council of the Pennsylvania State Dental Society. That such member shall have the same voice, rights, and privileges in council as the members of that body now enjoy. That the General Council of our State Society shall be composed of members thus elected by and representing the various component societies. That a Supreme Council shall be elected, as at present, from the floor of the annual meeting of our State Society. And that the president and secretary of the State Society shall be president and secretary of both councils.

For all general purposes both councils would meet in common session. The separate function of the Supreme Council would be to act the part of a higher tribunal in matters upon which the General Council might fail to agree, or in deciding matters which neither directly nor indirectly affected or interested the component societies, and for which deliberation the Supreme Council would meet in separate session.

We believe this would be the means of increasing the much-needed interest and enthusiasm in our component societies. There does not seem to be a proper representation under the present plan. History tells us that there was a time when "taxation without representation" was tyranny. In order that the component societies may not consider the parent tyrannical, proper representation is the logical thing needed. We can succeed only by having the strongest possible bond of union between all the various bodies and forces of our organization. Note the inscription—*E pluribus unum*—on Uncle Sam's coins, and consider the possible efficiency implied. Let us have a better bond, a closer union, and greater strength.

PROGRAM. CENSORSHIP OF CLINICS.

The program for the present meeting is worthy of comment. The papers are by masters, each in his own line; and if we may judge by the *personnel* of the men scheduled for discussions, we can be assured that nothing will have escaped them, and that the discussions will be spirited and to the point. The clinics listed seem interesting, instructive, sane, and sensible—we use the term "sane and sensible" advisedly. Every few years we have at our meeting a surfeit of clinics on some late, new fad which for the immediate time seems to engulf the things which are sane and sensible, and which for the time being had captivated and demoralized our profession to a degree bordering on incapability and inefficient service to the public. If we could formulate plans for so doing, we would recommend that there be appointed a body of suitable and carefully selected authorities, men whose judgment has been tried, seasoned, and standardized by years of competent and efficient service to humanity, whose duty it would be to censor for at least two years all the new hobbies, fads, and crazes that ordinarily upset the efficiency equilibrium, and threaten the mental equilibrium, of many of our best dentists. It is unfortunate that these things occur, but the fact remains that they *do* occur. We have only to look back over a few years to count over a goodly number of fads that have come and gone, their only effect being to more or less demoralize things for a brief period, and to create a feeling of distrust—and we may say disappointment in many instances—on the part of the public. During the same time other new things have been devised and put forth that have been highly efficient. But in both cases the ultimate sequelæ are usually rather near the surface, and by the proper direction of one's gray matter, the possibility of merit can usually be deciphered before much harm is done. We use the word "harm" advisedly, too. We do not claim that all new ideas and methods must be turned down and avoided. This would be a bar to all progress. But let us be deliberate, and think. Act in accordance with the sentiment of the immortal Alice Carey—

In words as in fashions, the same rule will hold;
Alike fantastic if too new or old.
Be not the first by whom the new are tried,
Nor yet the last to lay the old aside.

ORAL HYGIENE.

The Oral Hygiene movement comes with a stronger and stronger demand from the public, and our profession is pretty thoroughly keeping pace with it. The public is entitled to all that is being demanded along this line, and we must supply the demand. We believe this is being accomplished as expeditiously as our present abilities and possibilities will allow, but the work must go right on.

CONCLUSION.

We wish to thank the exhibitors for their punctuality in procuring space on the exhibit floor for this meeting, and for the magnificent display of instruments, equipment, and possibilities that they prepare for us, and that render possible the actual consummation of our duties to humanity. We sincerely hope that a full realization may be attained by our exhibitors.

Our committees deserve the highest commendation for the efforts they have put forth, and the results they have accomplished. Almost the entire success of our meeting is the result of the preparatory work executed by the committees. For their efforts and successes I wish to thank them on behalf of the society, and also personally.

I wish to thank the Pennsylvania State Dental Society for the honor bestowed upon me, and the confidence implied, in tendering this, the highest honor and compliment it can bestow. While I had hoped that possibly, at some future time, I might grace the presidential chair, yet I was content to go right on laboring in a minor capacity for the welfare of our society in other and smaller matters pertaining to it. Again, I thank you.

Dr. Friesell appointed the following committee to report on the Address of the President: Dr. W. H. Fundenberg, Dr. A. P. Lee, and Dr. H. S. Seip. The committee reported later as follows:

Report of Committee on President's Address.

Mr. Chairman and Members of the Pennsylvania Dental Society,—Your Committee appointed to consider the President's Address begs leave to report as follows: We agree most heartily with that portion of the address commenting favorably upon the recent revision of the state dental law and the additional legislation requiring annual registration.

Your president states that "the importance of the recent amendment requiring applicants for licensure by the state dental examining board to have had a four years' course of training cannot be over-estimated." We thoroughly agree with this movement, and believe it to be the solution of many vexatious educational problems. In view of the importance of this movement, however, and the fact that Pennsylvania is the pioneer commonwealth to insist upon the four-year standard, we feel that the speaker was too modest in allowing himself but half a page to tell of it. A brief history of the inception of the movement in our society would, we feel, have been most interesting to his hearers. We recall that last year's president's address contained suggestions regarding this representative plan, and we trust soon to see this or a similar plan adopted.

The president takes up, in the portion of his address devoted to providing a representation for component societies, a phase of our organization work that cannot have failed to impress all interested in the well-being of our society. His plan of having each component society elect a representative to a General Council of our body, while a Supreme Council be elected, as at present, from the floor at each annual meeting, seems the most logical plan so far presented. Many matters of detail would necessarily have to be worked out, but so far as we can see, no insurmountable difficulties present themselves, and we heartily indorse the plan.

With only one suggestion of our president does your committee take issue, namely, that pertaining to the appointment of "a body of suitable and carefully selected authorities, men whose judgment has been tried, seasoned, and standardized by years of competent and efficient service to humanity, whose duty it would be to censor for at least two years all the new hobbies, fads, and crazes that ordi-

narily upset the efficiency equilibrium, and threaten the mental equilibrim, of many of our best dentists." We dissent, because we do not believe that a body of men exists who would be capable of deciding for a profession just what inventions and discoveries might be correctly classed as "hobbies, fads, and crazes."

Respectfully submitted,

W. H. Fundenberg,
Alfred P. Lee,
Howard S. Seip, *Committee.*

The president, Dr. Lane, resumed the chair, and read a communication from Dr. O. U. King, secretary of the National Dental Association, congratulating the society on the passage of the new dental law of Pennsylvania.

The next order of business was the reading of the minutes of the previous annual session. Motion was made and carried that the reading of the minutes be dispensed with, as they had been printed in the Transactions and distributed to the members of the society.

Motion was then made and carried to adjourn until the afternoon session.

Tuesday—*Afternoon Session.*

The meeting was called to order at 2.30 o'clock Tuesday afternoon by the president, Dr. Lane.

The first item on the program was the reading of a paper by Dr. Nathaniel Gildersleeve, Philadelphia, Pa., entitled "Oral Infections."

[This paper is printed in full at page 1350 of the present issue of the Dental Cosmos.]

Discussion.

Dr. J. J. Moffitt, Harrisburg. I do not know of any subject that is of more importance to the dental profession than this. We are very much inclined to go deeply into the mechanics of our calling, as has been said, and neglect these phases, but if we want to lift our profession in the eyes not only of the medical profession but of the public at large, we must learn all about mouth infections. We do not want a patient to come to our office to be treated for an abscessed tooth and a week afterward have the physician examine the patient and find some diseased condition of the tonsils that might have been prevented; but we want to be able to recognize any impending conditions when we make our examination, and thereby prevent a lot of trouble.

With regard to the lack of co-operation between physicians and dentists, lack of interest in research work and lack of knowledge of mouth infections, on the part of dentists, I do not think that the dentist is as much to blame as the physician, because physicians have hospitals and large funds for research. Our state appropriates tens of thousands of dollars every year for the medical profession in all its branches, while we get less than three thousand dollars for all the work we wish to do, including state examinations, study and research, prosecuting illegal practitioners, etc. It would be of great advantage if this society could appropriate money for research in dental subjects. The essayist has enumerated the predisposing causes which reduce the vitality of the blood and interfere with its chemical constituents. To this list we might add another very important factor, that is, improper mastication, which may begin in infancy as the result of defective conditions of the teeth. Improper mastication means that the muscles do not get proper training, and the saliva is not mixed properly with the food, and as a result fermentation starts up in the alimentary canal, which may easily cause disturbances later in life that will result in reducing the vitality of the blood and retarding the formation of antibodies and other eliminators present in the blood.

As to the use of the radiograph, I agree with the essayist that it is very important. The essayist also discusses the question of faulty root-canal work done by dentists, which may readily be seen by means of the radiograph. I know this from my own experience in examining work of my own that I thought was perfect, and which proved

to be very imperfect as shown by the radiograph.

As to mercury eliminated through the salivary glands being called a mouth infection, in other words, mercurial poisoning being called a mouth infection, I think this is a condition in which there is a reduced vitality of the gums, so that various infections can be started. In mercurial poisoning I think, there is some action on the capillaries of the gums from within, but not a mouth infection. Whether the mercury is eliminated through the blood or lymph may be a question. I would be glad to know, also, whether there is any mercury eliminated by the salivary glands.

As to clinical laboratory methods as an aid to diagnosis, that suggestion is very important, and I believe many diseases can be discovered in this way. For instance, in a child twelve years of age we can find by a simple laboratory test pus cells under the edge of the gums, and the elimination of these by proper treatment may prevent considerable trouble and discomfort in after-life.

As to the etiology of pyorrhea, I do not believe that it has any specific cause. The suggestions and treatments given are all very good. The essayist mentions massage in this connection. Massage is almost as indispensable as is scaling. If we can teach the patient to massage the gums every night, it will prove a great aid in the treatment of pyorrhea. The patient should be taught, in massaging the gums about the teeth, not to rub simply one side of the gum and then the other, but to squeeze downward from the apex of the tooth toward the gingival margins, pressing both sides at once; in this way a good deal of purulent matter may be squeezed out that could not be removed by the patient in any other way. By doing this every night and using proper mouth antiseptics, we can do a great deal to improve the conditions and control the pyorrhea.

With regard to salvarsan, the essayist makes the statement that all spirilla could be destroyed in that way. I believe this would be of great value in the treatment of pyorrhea where spirilla, fusiform bacilli, and other germs are present that we cannot destroy by means of autogenous vaccines. When salvarsan was first introduced, it was claimed by Dr. Ehrlich to destroy all spirilla in the body as well as the spirochæta pallida —that is a point Dr. Gildersleeve forgot to mention. The principal difficulty in the use of autogenous vaccines lies in the fact that we can make a culture and produce an autogenous vaccine, inject this into the patient, and on examination afterward find that we have destroyed or eliminated the germs that were cultured, thus doing away with much of the pus and odor; but that the other germs have not been affected at all, and these are often the fusiform bacillus, the spirillum, and other germs which it is impossible to grow in any artificial media.

With regard to asepsis, of course care should be taken in dental operations in the same manner as in surgery to prevent infection being carried from one person to another by the operator. There is no field in which there is more danger of carrying infections than in dentistry, because there is such a great temptation for an operator, when he is working in the mouth, to reach into a drawer or some portion of his cabinet for some instrument needed. In nine times out of ten no infection may be carried to the patient, but there is always the liability of some serious infection being conveyed by careless methods.

I agree with the essayist that hydrogen dioxid is used too often, for the reason that it destroys reconstructive tissue. There is one feature about using some strong agents that is advantageous, namely, if we can entirely get rid of the germs by the use of strong agents, they cannot reproduce themselves without a reinfection, while the vitality of the tissue will accomplish reconstruction after the germs are destroyed. There are times when we must use our judgment as to whether a strong antiseptic should be used or not.

Dr. J. C. Nugent, Altoona. There is but one regret I have with reference

to this paper, and that is that Dr. Gildersleeve's work did not allow him to complete the paper in time to send copies of it to those who were to partake in the discussion. I am absolutely in sympathy with what we now term broader dentistry. Dr. Gildersleeve says that dentistry of today, and more especially the dentistry of yesterday, is not prepared intelligently to treat these conditions. The physician, likewise, is unprepared to treat them intelligently. That lack of preparation, however, I think, will be corrected in the very near future. The more I see of everyday dental office practice, the more firmly I am convinced of the very urgent need of just that sort of training. I hope that long before the four years' course shall have been inaugurated the colleges will see the need and institute certain proceedings that will correct in the future what has been the fault of the past. If the student of today can be shown that his faulty work has so much to do not only with his patients' comfort, but with their general health and life, he will receive a wonderful stimulus to bring the mechanical side of his profession up to a higher standard. It appears to me that if more time and thought were given to the investigations that I believe were instituted by Johns Hopkins University, in which our own Dr. Grieves is interested, the dental student would realize the danger lurking in the whole train of diseases and systemic conditions that follow ingestion of pus from the mouth, and receive a powerful stimulus toward eliminating faulty work. What Dr. Gildersleeve has said about root-canal fillings is true. I want to confess that when the radiography revealed to me some of my root-canal operations, I was surprised, and I have since been more careful in that work than I ever was before.

We cannot all have clinical laboratories, and personally I am not qualified to use the microscope intelligently, but, as Dr. Gildersleeve suggests, we have those at our elbow who can do this work for us and give us results. I want to call attention, also, to the seriousness of many of the oral infections. In the last few months I have seen two very serious cases of mouth infection. In the one case only the diplococcus could be discovered, but the patient was in bed for weeks and was prevented from pursuing his daily vocation for a greater period of time. The second case followed a low-grade pneumonia; after the patient recovered, antral empyema developed. An opening through the outer wall revealed the antrum to be full of pus. This patient had also an immense ulcer covering the entire left half of the maxilla and the adjacent mucous membrane of the cheek. Examination of pus from both these lesions showed the presence of pneumococcus, staphylococcus, and diplococcus. The patient's resistance had been lowered by her previous illness, and despite all efforts to correct this condition she died three weeks later from toxemia. So these cases are not to be considered lightly.

The subject of pyorrhea is one upon which probably the members of the profession are more decidedly divided than upon any other one subject in dentistry. I am not one of the men who claim that they can cure pyorrhea, and I am very seriously of the opinion that these claimants cannot cure it. Bearing in mind the train of troubles that follow ingestion of pus in the body, I believe that we have carried conservative dentistry to the extreme, and that in many cases extraction is far preferable to retention of teeth that will in themselves continue to be a source of danger throughout the time they are in the patient's mouth. Some years ago someone said that the trouble produced by bad teeth arose not nearly so much from the faulty mastication caused by them as from ingestion of pus. To me it is a great question what to do with deciduous molars in patients from eight to ten years of age; whether to extract them when they are beyond treatment, or whether to preserve them for the sake of the development of the jaws. I am leaning more and more to the conviction that extraction is preferable.

With regard to the use of salvarsan

and neo-salvarsan in the treatment of spirochetes in the mouth, I had an experience not long ago that impels me to sound a word of warning in that direction. Lues is produced by a spirochete, and this disease is most frequently treated with these remedies. If a patient knows the nature of the treatment instituted, he may think that we are trying to veil a diagnosis of syphilis, and resent it. A plain statement with reference to the treatment and its purpose will obviate this misunderstanding.

I would like to ask Dr. Gildersleeve whether it is advisable to use stock vaccines in the treatment of some of these cases; for instance, in cases where microscopical examination has been made and the causative bacteria have been definitely determined, would he use a stock serum developed from such bacteria?

As to the use of hydrogen dioxid, I believe practically every member of the profession now knows that it is inadvisable to use this medicament in a pus cavity. Of course, *we* do not use it, but the other man does. Not long ago, a patient presented at my office after having had hydrogen dioxid injected into a putrescent canal. The result you all know. The patient suffered for hours afterward with intense pain. Not only is the pain very objectionable, but the force of the hydrogen dioxid drives the bacteria into the normal tissues—an effect not to be desired.

Dr. Hermann Prinz, Philadelphia. This has been a very instructive paper. It covers so much ground that it would be impossible to touch upon all the items enumerated, but the essayist incidentally suggested a few points relative to therapeutic measures, in which, as you know, I am particularly interested. I shall not attempt to discuss all the points brought out in this connection, but with your permission I will refer to a few diseases which he has mentioned from the therapeutic point of view. One disease which Dr. Gildersleeve overlooked, and which at this moment is of a somewhat epidemic nature in certain portions of New York and Pennsylvania, and which produces definite lesions in the mouth, is what is known as foot-and-mouth disease. Primarily this is a cattle disease, nevertheless by contact with the diseased animals it is easily transmitted to the attendant, and a few of these cases have come under my observation. Having had some experience with the disease in my student days in Germany, I recalled at once what should be done, and suggested the proper treatment, and from the reports received I was much pleased to learn that the oral symptoms were rather quickly eliminated. Remember that no specific organism has been isolated as far as this disease is concerned. It is an infection followed by swelling and severe pain, manifesting itself in the form of an ulcerative stomatitis. From clinical observation I have found that 8 per cent. zinc chlorid in water acts almost as a specific, not a specific in the sense of the word as quinin in malaria, or emetin in the elimination of the amœbic infection, but in so far as it will bring about a quick resolution of these infected surfaces. The solution is applied with a swab. Incidentally some mild antiseptic solution of an alkaline type, *i.e.* a 2 or a 3 per cent. sodium bicarbonate solution, is recommended. This solution should be used warm at about body temperature.

Dr. Gildersleeve, as well as the last speaker, referred to the use of salvarsan. As you know, salvarsan is a true specific, one of the very few specifics which we possess for the control of certain infectious diseases. The causative factor of syphilis is thought to be the spirochæta pallida, and in all cases of syphilitic infection in which the spirochete can be diagnosed, the application of salvarsan will act as a specific. Its local application is best accomplished by using a 10 per cent. solution of salvarsan in glycerin applied with the swab, and I venture to say the results will be very beneficial.

Reference was made to mercurial stomatitis by Dr. Gildersleeve, as well as by Dr. Moffitt, as relative to the causation of this disease. Experimentally we

have been able to produce the disease in the dog by feeding or injecting relatively large amounts of mercury. The mercury is largely excreted with the saliva; by its irritation a definite lowered resistance of the mucous membrane is produced, which in turn opens a way for microbic infection. Ordinarily the mouth is filled with all sorts of organisms, pathogenic and saprophytic, which are present in about equal quantities. As soon as a lowered resistance of the mucous membrane is established, as in the case of the excreted mercury, the pathogenic bacteria gain the upper hand and infection is the result, manifesting itself in the various forms of mercurial stomatitis. For this very reason mercurial stomatitis is a preventable disease; *i.e.* if all foci of possible attack in the oral cavity are removed prior to the beginning of the mercurial treatment, such as extracting foul roots, removal of calcarious deposits, filling of cavities, etc., usually no manifestation of mercurial poisoning of the oral mucous membrane is observed. If a rigid oral hygiene is established the patient can be placed on mercury without developing mercurial stomatitis in the great majority of cases. On the other hand, if this is neglected, it is reasonably sure that in a short time the patient will show definite manifestations of this disease.

As I said before, I only selected a few points for discussion from the standpoint of the clinical therapeutist, and I have tried to make a few suggestions as to some of the medical measures which at some time may be of benefit to you in your practice.

Dr. H. E. Friesell, Pittsburg. I wish to compliment the essayist on being one of the few physicians who have begun to appreciate certain facts that dentists have known for a considerable period and have tried to impress on the medical profession, that is, the far-reaching effects of neglected mouth conditions.

There is but little in the paper with which I could wish to differ very materially. There is one point, however, that the essayist has called attention to, which might bear amplification, viz, the lack of interest in mouth infections and conditions can be partly attributed to the lack of attention devoted to the subjects bearing upon these conditions by the dental schools. Undoubtedly the dental schools are not doing as much in these subjects as they might, but is that the whole cause of the trouble? If the schools are not doing their duty in this respect, why should not the state boards go into the schools and examine intimately into the courses being taught in institutions over which they have jurisdiction, and when they find courses slighted, insist that they be amplified sufficiently. Is the profession of this state, as represented by this society, doing its duty in this respect? Is the profession of this state, as it manifests its interest in local societies, doing its duty? Let us go to the clinics, to the exhibits, to the places where mechanical tricks of one kind and another are being shown, and notice how hard it is to get a place, how the members flock to such exhibitions; or when someone offers us a postgraduate course which will teach us how to secure double or treble fees for our operations, how intensely interested we are. On the other hand, when it comes to a subject that means work, or study, that seems vital to the welfare of both patient and dentist, it does seem very hard to get up an interest. The Educational Council of America is recognizing these facts, and has, for the past year, been making a careful inspection of the schools, and probably in another year will be able to lay down standards that dental schools must meet if they are to be recognized as worthy educational institutions, and our State Society and board can support this council very materially in its work.

I agree with the essayist's opinion in regard to the lack of knowledge of the definite cause of pyorrhea, and in regard to the definite statement that the amœba is not the specific cause of pyorrhea. I feel that it has been unfortunate in several senses that the endamœba has been designated as the cause of pyorrhea

without apparently sufficient consideration. The recent book issued by Bass and Johns, I feel, is going to do much harm to the dental profession. No such book should be published without a better foundation in fact for the statements which it attempts to promulgate. I believe that pyorrhea is primarily an infection of the gingival portion of the peridental membrane, and can in almost every case be traced to physical injury of that tissue, and that the development and continuation of the disease is due to local infection.

The radiograph has been a great help to us in dentistry, but another very important field that has been much neglected is the knowledge of the normal conditions of the mouth, which few of us have sufficiently studied. A recognition of the pathological conditions will very frequently render a definite diagnosis possible without the assistance of the radiograph.

The elimination of mercury, or the method by which it is eliminated, raises the question as to whether or not many of these conditions may not be due to the action of certain glands about which we know very little, and about which we have studied very little; glands located in the gingivæ and peridental membrane, and which I believe in the next few years will receive much more attention, and which will be found to have a much more important bearing upon gingivitis and diseases of the membrane than we now suspect. For instance, if this is not the case, why should we have the gum line so definitely placed in case of lead poisoning or poisoning by bismuth subnitrate, and why should we have intense inflammatory conditions in cases of mercurial stomatitis at this point [illustrating], about two or three millimeters apically of the normal gum line or occlusal edge of the free margin of the gum?

The statement made by Dr. Moffitt that the dental profession is not entirely to be blamed, because it has made no great progress in the line of pathological research, is a good one. We know that the State of Pennsylvania has been liberal in the treatment of the medical profession, but has done very little for the dental profession, simply because dentists have not been organized, and have not intelligently asked for state aid.

One of the most important points in the paper is that much of the failure or the slow progress in appreciating pathological conditions is chargeable to you and me—to the individual member of the dental profession. The difficulty I believe lies in the fact that the student does not sufficiently appreciate the importance of a knowledge of pathological conditions when he comes to school, and the dentist to a great extent is to blame for that status of affairs. Many of you who send students to school tell them to learn to operate, to do crown and bridge work, and impress upon them that the science branches do not amount to so much. We know that these branches are paramount, and we should recognize that fact. We must have this conviction ourselves before we can convince the student that the demand for his services in the future will be in this rather than in the mechanical field. Our knowledge of the importance of the mouth as a portal of entry for most pathogenic organisms that enter the body is daily growing. But do you realize that in two of the largest cities in our commonwealth, in which there is dental service in the public schools, it is routine practice in the treatment of root-canals to leave these canals open, without any fillings, and to stain them simply with silver nitrate? In one of these cities the clinic is supervised by a physician, in the other by a dentist. Just compare such practice with the points brought out in the paper! I believe firmly that the future of dentistry lies rather in the development of dental pathology than in any other one branch.

Dr. Gildersleeve (closing the discussion). I tried to make plain in my paper the fact which Dr. Moffitt brought out, namely, that the lack of co-operation between the dental and medical practitioner is not the fault of the dentist nearly so much as that of the physician. I am a physician and have been inter-

ested in dental diseases since 1904. I have been dealing with these conditions to a greater or less extent since 1905, and today am teaching in a dental school. Dr. Moffitt brought out the fact that improper mastication is one of the factors concerned in gastro-intestinal disorders; this is, indeed, an important factor.

I am not opposed to the use of antiseptics when the solutions are employed in the proper treatment of certain conditions; they are absolutely essential; but I do not feel that it is a good plan for us to take a mouthful of these antiseptics and wash out the entire oral cavity. They are excellent agents when applied locally in the proper cases.

Dr. Nugent mentioned the fact that the physician knows litle or nothing of oral infection; that is true, very few of them do, but we find a great many who *think* they do. This winter we have had any number of cases sent to us by physicians with definite orders as to how we shall treat the patient. For instance, one patient having a case of pyorrhea presented with directions from the physician that we inject emetin subcutaneously. Injection of emetin subcutaneously is an excellent therapeutic procedure in cases of amœbic dysentery, where the amœba is found in the intestinal mucosa and not readily reached by emetin given by the mouth, but I can see absolutely nothing rational in injecting emetin subcutaneously, or, as two or three have advocated, injecting it intravenously, for the destruction of oral amœbæ. When I introduce a hypodermic needle into a vein for the purpose of injecting a substance into the blood or removing blood for examination, I do so with more or less hesitancy, realizing the danger of infection attending that operation, and if we were to attempt to inject emetin intravenously for all pyorrhea patients, we would encounter some general infections that could not truthfully be attributed to absorption from the localized point of infection in the oral cavity!

Dr. Nugent also mentioned the need of stimulating students to take more interest in this line of work. This we are trying to do. This past winter I had all of my students working on pathological cases. At first I had to do a little driving, but they soon became interested, and the majority of them did good work.

Dr. Nugent mentioned the difficulty or impossibility of absolutely curing pyorrhea, and right after that mentioned one procedure by which we can absolutely cure pyorrhea, namely, by extraction of the teeth. Get rid of the teeth and cure the pyorrhea. Manifestly no one will resort to this procedure excepting as a last resort.

Dr. Nugent asked whether or not, after finding micro-organisms in case of pyorrhea, the stock vaccines might not be used. I have never seen any stock vaccines, other than possibly some of the aureus stocks and gonococcus stocks, that were of any value whatever in my estimation. I have never seen streptococcus stock vaccines which I would consider of any use whatever; this is also true of some other stock vaccines. We are dealing with so many strains of these micro-organisms that the man who is making stock vaccines does not stand one chance in fifty of hitting the right organisms. The typhoid stock vaccines have been used as immunizing agents, and we must admit that apparently they are as good as other typhoid vaccines, but the rational preparation of the typhoid vaccine in case of typhoid epidemics would be to prepare the vaccines from that particular strain of micro-organism which is causing the epidemic.

As regards the necessity of the state board taking up the question of dental education along scientific lines, as mentioned by Dr. Friesell, I want to say that I do not think that course will be at all necessary. I believe that every institution in the state—I know those in Philadelphia are, and I believe the one that Dr. Friesell is connected with in Pittsburgh is doing the same—are stiffening up their courses along these lines a great deal. If we could have the men who have been in practice for a number of years come back to our various schools

and take a postgraduate course, they would be in a more receptive condition than the average undergraduate student. You have, as it were, to pound it into many students, but the man who comes back realizing what he wants, will take it faster than we can give it to him. We have had some experience in that line in Philadelphia in the past three years. We have had a study club composed principally of members of the Academy of Stomatology, and among them professors and instructors from all three of the dental schools, as well as graduates of the different schools. These men have for three years been attending study-club sessions one night each week for a period of two hours, and I have never seen a more interested body of students in my whole career as a teacher. As I say, the dental schools, of this state at least, are all stiffening their courses, and are all going to turn out men who are better prepared from the scientific point of view, and we are going to have more thorough teaching in histology, histo-pathology, pharmacology, general pathology, and special dental pathology than we have had heretofore. There is one thing that we must remember, however; that is, that there is no college in the state which can handle all the men who want to study dentistry, and in working for the best advantage of the students, all of our dental schools must work together.

The next item on the program was a paper by Dr. L. E. Custer, Dayton, Ohio, entitled "A System of Making Jacket Porcelain Crowns Without Fusing."

[This paper is printed in full at page 1356 of the present issue of the Dental Cosmos.]

Discussion.

Dr. C. S. Van Horn, Bloomsburg, Pa. A system of making a jacket porcelain crown without personally baking it, when advocated by a recognized pioneer in the porcelain field, seems at first glance a bit anachronistic. Yet as we carefully peruse the paper and read between the lines we seem to see a possible excuse for the effort, at least from the viewpoint of one strongly favoring the jacket type of crown.

Personally, I am not strongly inclined toward the porcelain jacket as a crowning method. The very few cases in which these crowns are indicated as a possibly better restoration are almost negligible in quantity, and the difficulties entering into the procedure of stump preparation and of crown construction do not seem to justify these means to the end.

With the materials at present at hand, we fail to see any advantage in the previously baked, metal gasket crown over the personally baked jacket, save perhaps in regard to shade. In fact, we are disposed to prefer the baked jacket to the stock crown jacket with its metal gasket at the cervical joint, when considering the fit at the joint, the continuity of structures, and the occlusion. We consider it akin to impossible to grind a joint between the jacket and the shoulder, and we cannot conceive of a metal gasket, made in the manner described in the paper, with close joints between root and crown, and finished flush with the root and crown peripheries—especially in cases as illustrated in his Fig. 6, in which approximal decay has progressed to quite an extent up the side of the root. I have had considerable experience with the class of cases shown in Fig. 6 in conjunction with the cast cope process, and I find it no small task to get the wax pattern perfectly finished around the half-moon area. If it be difficult to finish a wax pattern in those cases, the added difficulty in adapting and finishing a gold-platinum gasket seems almost insurmountable.

We hear of split roots following the setting of unbanded crowns. I am emphatically against the banding of roots, and have at every possible opportunity branded that practice as unscientific, but *not* from the viewpoint of split roots. In a practice of over twenty years I have not seen a single case of split root that could be attributed, even by a stretch of the imagination, to a

bandless crown, and my observations have not been confined to the community in which I practice, for I see the work of a number of different dentists practicing not only in this country but abroad. I am strongly inclined to view the split-root idea as an idea rather than a fact of any moment. Therefore we consider the so-called porcelain detached post crown with a cast gold cope superior, esthetically and anatomically, to any crown made at present. The technique is usually exceedingly simple; it is applicable to the ten anterior teeth; it is not subject to glaring inaccuracies in fit and in continuity of structures even in exaggerated cases; it has proven adequately substantial in a large percentage of cases, which is substantially corroborated by the Logan crown; it allows of easy replacement in case fracture does occur or a change in shade is desirable; it can be used on any root admitting porcelain crowning by any system, and when all other systems fail by reason of a broken-down condition of the root, it not infrequently happens that the cast cope crown can be satisfactorily utilized.

If the essayist, however, can interest tooth manufacturers to the extent of supplying an adequate assortment of porcelain jackets, and then can perfect a process of making a wax pattern and casting a gold gasket—a process which does not appear exceedingly difficult—the system of porcelain-jacketing without baking might assume a different aspect.

I am pleased to have been accorded the honor and the priviledge of discussing a paper by a man of Dr. Custer's recognized ability. While my remarks do not seem to completely coincide with his views and technique, who can say that differences of opinion are antipodal to progress? My understanding is that no system or method of crowning extant approaches perfection; therefore, if the paper should by any chance be the means of laying the cornerstone for a more perfect system, we shall feel that it has been of inestimable value, and that Dr. Custer will have added another brilliant feat to his achievements.

Dr. R. J. Seymour, Philadelphia. I received a copy of the essayist's paper some few weeks ago, and became interested in it at once for two reasons—because I had never doubted for a moment the efficiency of the jacket crown; because the essayist's technique for making a crown without fusing eliminates one of the difficulties of making this crown. I considered it to be unfair to the essayist to attempt to discuss this method without having made the crown. I therefore resolved to make a crown after his method, and would have done so if a practical case had presented, but, lacking this, I made one as a technical experiment. The preparation as represented by a technical case is, of course, of value so far as the technique is concerned, but such a case conforms to only one condition in the mouth, that is, when the tooth stands alone and all the sides are accessible; but difficulty arises in forming a shoulder on a canine that stands between a lateral and bicuspid. It would be easy enough to form the shoulder on the lingual and labial surfaces, but its preparation on the approximal surfaces presents difficulties. Having followed the preparation of the root, I proceeded with the preparation of the crown. This was done by grinding under water and with Miller points, by which the crown may be hollowed-out in a short time. The next step was the process of making the little washer that seals the joint between the crown and the root. Dr. Custer says that he developed this method for those not equipped for baking crowns, so that they could easily make this crown. I called on the leading dental houses in Philadelphia, but I was unable to get No. 10 gold and platinum foil, so I formed the collar in wax and cast it in gold. This method, I believe, is preferable, for the essayist's procedure calls for an alloyed metal, which is more or less difficult to adapt.

In the latter portion of his paper the essayist refers to the setting of the crown with Tenacit, and cites all its good qualities, but he overlooked one of the bad features, namely, that it adheres

to the porcelain but not to the tooth substance. I do not doubt for a moment that the essayist obtains good results, and that his crowns stay in place because of their proper adaptation, but I doubt very much if the average dentist would have the same success.

Dr. J. C. Hertz, Easton, Pa. I want to congratulate Dr. Custer on his efforts in porcelain work, in which he has been engaged for the past twenty years, and particularly on his endeavor to simplify the making of the jacket crown. To me one of the doubtful points is the preparation of the root. Few cases have come to me in which this procedure seemed to be practical, owing to the fact that there is generally a mesial or distal cavity extending well beneath the gum; but I am pleased that he has developed a method which simplifies the making of the jacket crown and bears out what has been told us at different times, namely, that no porcelain is as strong as the porcelain which is made under pressure by the dental houses; the porcelain we build over a crown is never so dense as that which is made in a mold.

Dr. Van Horn made a remark that I want to take issue with, that is, his condemnation of the banding of a root. Just in proportion as we condemn the banding of a root with an iridio-platinum or platinum and gold band, do we increase the necessity for the use of the all-gold crown, and that is one of the reasons that the all-gold crown is being so much resorted to. Dr. Van Horn claims that he has very seldom seen a split root; I have seen many, and know of many other cases. In many of these cases crowns come off because the roots have not been properly banded. In the majority of unbanded crowns, the cement is dissolved in time, and the crown eventually comes off from loosening or from splitting of the root longitudinally. That is the reason why the all-porcelain banded crown, if properly made, rarely comes off. I think the discouraging of the banding of roots is a retrogressive step. Correct banding certainly requires a high degree of skill and a greater armamentarium, but I wish to enter a protest against the technique advocated by Dr. Van Horn.

Dr. F. W. Allen, Philadelphia. I would like to ask the essayist if there is not a discrepancy in the size of a crown when biscuited and when finally baked?

Dr. Custer (closing the discussion). Dr. Van Horn spent considerable time in discussing the fact that he had seen but very few split roots. Dr. Hertz and I are in agreement on that point. I have seen a great many such cases, but never when the root had been banded or covered with a jacket crown. The only difference in the making of the gasket by casting and the procedure I called attention to is the great saving of time. I can make a crown in the manner described in almost the time required for getting the wax pattern ready.

Dr. Seymour refers to the difficulty in the preparation of the tooth mesio-distally; this is the easiest part. We can carry a carborundum stone a little way around to the front and back, and then with a No. 4 bur finish the preparation very easily.

With regard to Tenacit: I have used this material for cementing crowns for the past eighteen months, and have never had a crown come off. I think Dr. Seymour is mistaken in saying that it does not adhere to the dentin. Dr. Allen misunderstood me. I purchase these crowns in the biscuited form, hollow them out, and return them to the manufacturers for final baking. The more accurate fitting is done afterward.

The society then adjourned until the evening session.

Tuesday—*Evening Session.*

The meeting was called to order on Tuesday evening at 8.30 o'clock by the president, Dr. Lane.

The secretary, Dr. Weaver, read a report from the Council.

Dr. Weaver also presented an invitation from the Ohio State Society to

the members of the Pennsylvania Dental Society to attend the annual meeting of the Ohio Society, December 7, 1915, at which time the unveiling of the Miller Memorial would take place.

The next item on the program was the reading of a paper by Dr. HERMANN PRINZ, Philadelphia, entitled "The Diagnosis of Diseases of the Dental Pulp."

[This paper is not reproduced here for the reason that it has been published in full in the September 1913 issue of the *Dental Summary.*]

The meeting then adjourned until Wednesday morning.

(To be continued.)

NEW JERSEY STATE DENTAL SOCIETY.

Forty-fifth Annual Convention, held at Asbury Park, N. J., July 21 to 24, 1915.

WEDNESDAY—*Morning Session.*

THE forty-fifth annual meeting of the New Jersey State Dental Society was called to order on Wednesday, July 21, 1915, at 10.30 o'clock, in the ballroom of the Coleman House, Asbury Park, by the president, Dr. Walter F. Barry, Orange.

Rev. Dr. JESSE HEIRMANN, First Presbyterian Church of Asbury Park, opened the session with prayer.

The President then introduced to the society the Hon. CLARENCE E. F. HETRICK, mayor of Asbury Park, who welcomed the society to Asbury Park, as follows:

Mr. President, members of the New Jersey State Dental Society, ladies, and friends,—I have great pleasure in welcoming this morning to Asbury Park the forty-fifth annual convention of the New Jersey State Dental Society. It is not only an honor to welcome you, but a pleasure as well. In saying that I speak from the heart. I speak as representing the city of Asbury Park officially; I speak as representing the citizens of Asbury Park, and in extending this welcome I represent also Miss Asbury Park, who extends to you the "glad hand." Asbury Park has been fortunate in having the New Jersey Dental Society meet in our city for many years. I think, on only one or two occasions has the society neglected to come back to us. I therefore consider the New Jersey State Society and its work a part of the work of the city of Asbury Park. We feel that the society has grown with us, and that we have grown with it, and that it has improved by its coming to Asbury Park, and that Asbury Park has been improved by the work that the dental society has done in our behalf. Therefore it is more than a pleasure to welcome you this morning, to wish you well in your work, and to ask you to come back to us from now on "until time immemorial shall pass." That I do in the fullest measure, and in closing I want you to remember that Asbury Park, borne by the light that floods the Eastern sea, always bids you welcome with open arms, and asks you to share its pleasure and view its charms. I want to thank you.

The President announced as the next order of business the calling of the roll.

Dr. R. S. HOPKINS moved that the calling of the roll be dispensed with at this time, and that the secretary be instructed to make a note of a quorum being present. (Motion carried.)

The next order of business was the reading of the minutes of the previous annual meeting.

Dr. ALBRAY. I move that the reading of the minutes be dispensed with, and that they be accepted and approved as printed in the record. (Motion carried.)

The next order of business was the reading of the President's Address. Dr. Barry called Dr. Henry Fowler, vice-president, to the chair while he read his annual address, as follows:

President's Address.

By WALTER F. BARRY, D.D.S., Orange, N. J.

Mr. Chairman, members and guests of the New Jersey State Dental Society,— The forty-fifth annual convention of this society, owing to the wonderful and efficient work of the chairmen and the gentlemen comprising our committees, bids fair to excel any held during our past history, and I consider it a great privilege and honor at this time to welcome you to our convention.

For a number of years past I have watched very carefully the constructive work that was being carried out by the members of our society, and I have every reason to believe that at this convention some of our most cherished hopes will become a reality. I refer in part to the adoption of our new constitution and by-laws. It is quite unnecessary for me to dwell on this matter but for a moment; however, I trust that each member of our society has looked over the proposed changes, so that we can get through with this very important work in as short a time as possible.

You are undoubtedly aware of the fact that your Legislative Committee, in conjunction with the members of the State Board and Executive Committee, during the past term of the legislature, succeeded in having passed laws most favorable to the profession and the general public of our state. Your new Executive Committee, elected last year, has proved itself to be a most satisfactory and efficient body, and contrary to the opinion of some, it has not only proved a great success, but has injected new life into the society, owing to the fact that each local society has, through its executive member, been given a voice in all matters pertaining to state affairs.

The State Board has been doing most excellent work, and is justly entitled to receive the undivided support and cooperation of every member of our society. Contrary to the prevailing opinion, the path of the men comprising this board is not entirely strewn with roses. I have seen these gentlemen make every effort to eradicate some objectionable features that have existed in the past, in which they have been most successful.

Your Exhibit Committee, with Dr. Egel as its chairman, has accomplished a work this year that is nothing short of marvelous. You must realize, gentlemen, that this committee has been working with the greatest of obstacles in its path. I refer to the National meeting at San Francisco: so many of the firms have arranged to send their exhibits to California that, if it were not for Dr. Egel and the committee's untiring efforts, our exhibits this year might not have been what we should expect. However, I have inside information that the chairman's report this year will bring joy to the heart of the "watchman" of the treasury, and strike terror to the hearts of the illegal practitioners in our state.

Dr. Hodges, as chairman of the Clinic Committee, has instituted a number of original ideas in the work of his committee. They have arranged for a great many very interesting and instructive clinics, and instead of finding it necessary to hustle for men to give clinics, as was the case in previous years, they have had the privilege of selecting the names of gentlemen who would give clinics best suited to the wishes of the society. And so I might go all along the line of committees, if time permitted, and in no case should we find one who has in the least shirked a duty that might work out for the betterment of our society.

The staff of the *New Jersey State*

Dental Journal has been doing most excellent work during the past year. Dr. Albray, Dr. Davidson, and the various other members of this organization have through their efforts exerted an influence in dental circles that has caused our publication to be favorably known wherever dental journals are read. I do not think any of us realize the amount of work involved in the publication of this journal, and as I have many times said in the past, it would be to the interest of every individual member of our society to do everything possible to assist these gentlemen in order to make their task as light as possible.

I cannot refrain at this time from metioning the name of an officer who, in my opinion, has done a most wonderful work for our society. His office and the affairs of the society in his hands are a marvel of efficiency; no job has been too great; his sacrifices have been many, and I feel that the New Jersey State Dental Society is particularly fortunate in having as secretary such a competent man as Dr. John C. Forsyth.

For the last seven or eight years the members of our society, by their unceasing efforts, have raised the standard of our organization to a high point of excellence and efficiency.

We are growing very rapidly, and we have among our members a great many young men who must shortly take up the reins of the society and its affairs. I would therefore suggest that all the young men make a start and lend their help, so that, after a few years more of constructive work, our society will be considered the leading one of the United States, not necessarily in point of members, but in big things accomplished.

During this convention the members will have before them a number of matters of vital importance for their consideration and action. The most important will be the matter of reorganization and adoption of the new Constitution and By-laws. Needless to say, this matter will occupy considerable time, and is worthy of our undivided attention, as our society has been occupied, to a great extent, with this matter since the convention of 1908. In view of this fact I have decided to make my address as brief as possible, in order that what I consider a more important matter, our constitution and by-laws, may be given the time it so justly deserves. I will therefore take but a few moments to bring before the society a few other matters for your consideration.

Dr. Gelston, in his presidential address, has previously brought before the society a matter which I deem of great importance to New Jersey, that is, the question of having a reputable dentist appointed on the State Board of Health. I might, in fact, go a little farther, and say that I consider that our profession is justly entitled to representation on the board of health in each municipality in our state. The physicians and general public are rapidly realizing that oral hygiene is an absolute necessity in order to maintain the health of the individual, and for that reason I would assume that any concentrated action by this society toward bringing about the desired result would meet with the approval of the citizens of our state, and receive their indorsement.

I would therefore most respectfully recommend that a committee be appointed to take this matter up with the Governor, and procure from the secretary of each local society in the state a petition, signed by each member of the local society, in order to present such petitions to the Governor, requesting that he appoint a dentist to the abovenamed body.

I feel that I should call to your attention for consideration at this session the question of what legally constitutes the boundaries of the field of dentistry in this state. I feel that this is a matter well worthy of our attention at this time, especially in view of the fact that some people have inquired if a legally licensed dentist is permitted, according to law, to administer anesthetics, etc.

I would therefore respectfully recommend that the privileges and legal status of a dentist be definitely determined.

I also wish to recommend at this time

that our Legislative Committee take up the matter of exemption from jury duty during the coming year.

For some time past, a number of our members have been called for jury duty at times when they were caused very serious inconvenience and financial loss, and I feel that this matter should be settled at the coming session of our legislature.

I would like to submit to you my recommendation on this question. The question has probably come before our society on various former occasions, but I would like to speak of the matter now, provided you refer this address to a committee for further action. My recommendation is the exemption of dentists from jury duty. I know that this matter has been brought before various dental societies, and it is a most important item. Only quite recently there have been in the Union County Dental Society cases of two or three men who were called for jury duty to their very great disadvantage.

In closing, I again wish to thank all our committees and every member of the society who has in any way contributed toward the success of this convention.

My year of office as your president has been a most pleasant one, and this was only brought about by the very kindly good feeling extended to me by the society, and by the willingness of its members to do their utmost for the betterment of dental conditions generally. I assure you I greatly appreciate what has been done to make my term of office so pleasant.

I trust that we will all continue in the good work, and that the New Jersey State Society will uphold its reputation for doing big things for the general public and for our profession.

Dr. Joseph Kussy moved that the President's address be referred to a committee of five, to be appointed by the chair.

The motion was carried, and the chairman, Dr. Fowler, appointed the following as the Committee on the President's Address: R. A. Albray, G. H. Hillman, G. M. Holden, E. H. Ginnelley, and S. I. Callahan.

The president, Dr. Barry, then resumed the chair and called for the Report of the Membership Committee.

Dr. H. B. Van Dorn, chairman of the Membership Committee, reported progress and asked the privilege of making the full report of the committee at a later session.

The President then called for the report of the Committee on Reorganization.

Dr. Henry Fowler, chairman of the Committee on Reorganization, presented the report of his committee, which consisted of several proposed changes in the constitution and by-laws with a view to having the New Jersey Dental Society become a component society of the National Dental Association.

The amendments to the constitution and by-laws were submitted to a special committee appointed by the president, which committee later presented its report recommending the adoption of the proposed amendments, and the report was adopted by the society.

The secretary, Dr. Forsyth, read a communication from the Ohio State Dental Society inviting the members of the New Jersey Society to its fiftieth anniversary meeting to be held in Columbus, December 7, 8, and 9, 1915, at which time the American Miller Memorial would be unveiled, and asked that the society appoint a representative for that occasion.

Dr. Hopkins moved that the communication be referred to the Executive Committee with power to appoint such representative.

The Secretary also read a letter from the Asbury Park Lodge of Elks extending an invitation to the privileges of the club; also a telegram from the Panama-Pacific Dental Congress Committee inviting the members of the society to the coming congress.

Dr. Barry. I will ask the secretary to read the names of the members who

have passed away during the past year, and then appoint a Memorial Committee at this time to draft suitable resolutions.

The Secretary read the following list: J. F. Crandall, Atlantic City; Robert Wakefield, Cranford; E. O. Peck, Morristown (honorary); M. W. Foster, Baltimore, Md. (honorary); H. D. Gihon, Trenton; Edw. H. Webb, Jersey City; Thomas J. Hogan, Dunellen; T. T. Wilkinson, Jersey City; Louis Jack, Philadelphia, Pa. (honorary).

Dr. Barry. I will appoint the following Memorial Committee: George T. Moore, Joseph S. Vinson, George M. Holden, Frank W. French, and Marcus Straussberg.

The society then adjourned until eight P.M.

Wednesday—*Evening Session.*

The meeting was called to order at 8.30 o'clock P.M. by the president, Dr. Barry.

Dr. Barry announced as the first item on the program for the evening session the reading of a paper by Dr. Hermann Prinz, Philadelphia, Pa., entitled "The Relationship Between Saliva and Dental Caries."

Dr. Prinz' paper was discussed by Dr. McGehee and Dr. Albray.

Dr. Fowler. Mr. President, I move that the society extend to Dr. Prinz and the gentlemen who have discussed this subject, a rising vote of thanks.

The motion was seconded and carried.

Adjourned until 10 o'clock Thursday morning.

Thursday—*Morning Session.*

President Barry called the meeting to order at 11 o'clock Thursday morning.

The President. We will now hear the report of the Committee on the President's Address, by Chairman Raymonde A. Albray, and I will ask the vice-president, Dr. Henry Fowler, to take the chair.

Report of Committee on the President's Address.

Mr. Chairman and gentlemen,—Your committee appointed to consider the President's Address submit the following report:

(1) The first recommendation contained in the address is, That a committee be appointed to secure from the secretary of each local society a petition signed by each member of the local society, requesting the Governor to appoint a dentist to the State Board of Health of New Jersey.

We, the Committee on the President's Address, concur in the above recommendation and move its adoption.

(2) Your president recommends that it be definitely determined what legally constitutes the boundaries of the field or practice of dentistry.

The concluding paragraph of this section is quoted: "Before considering the adoption of my recommendation on this subject, it should be decided whether the words found in the dental statutes of New Jersey already give the examining board an unassailable right to define the field of dentistry, or whether something should be added to the statutes more literally stating that the examining board has this power."

Your committee, after careful consideration of the foregoing recommendation, has concluded that this matter is one for the Legislative Committee to investigate before the society takes action, and we therefore suggest that this recommendation be referred to the Legislative Committee for its consideration.

(3) This recommendation has to do with the abolishment of jury duty for dentists in the State of New Jersey, and your committee concur in the recommendation, and move that the matter be referred to the Legislative Committee, with instructions to institute an active campaign to secure legislation which will accomplish the desired result.

Raymonde A. Albray, *Chairman.*
Guy H. Hillman.
S. Irving Callahan,
Edwin H. Ginnelley,
Geo. M. Holden,
Committee.

Dr. Kussy. I move that the report be accepted, and the recommendations concurred in. (Motion carried.)

Dr. Barry resumed the chair and announced that the next business in order would be the nomination and election of officers to serve for the ensuing year.

Election of Officers.

The election of officers for the ensuing year resulted as follows:

President—Dr. Henry Fowler, Harrison.

Vice-president—Dr. James I. Woolverton, Trenton.

Treasurer—Dr. Charles F. Jones, Elizabeth.

Secretary—Dr. John C. Forsyth, Trenton.

Executive Committee—George W. Wakely (Central Association). D. G. Farrington (Clinical Club). George W. Wilkens (Mercer Soc.). F. H. Lum (Tri-Co. Soc.). A. Percy Roberts (Union Co. Soc.). George H. Grim (Hudson Co. Soc.). Asher S. Burton (Monmouth Co. Soc.). A. R. Slade (Southern Co. Soc.). Mortimer P. Shoemaker (Atlantic Co. Soc.). Frank W. French (Plainfield Soc.). Marcus Straussberg (G. V. Black Dental Club). Franklin Rightmire (Passaic Co. Soc.). S. G. Wallace (Ocean Co. Soc.). W. W. Hodges (Middlesex Co. Soc.).

Membership Committee—Ed. L. Wharton (Central Association). Adam Glutting, Jr. (Clinical Club). F. K. Heazelton (Mercer Soc.). B. W. Crane (Tri-Co. Soc.). Geo. S. McLaughlin (Middlesex Co. Soc.). Adolph Degenring (Union Co. Soc.). R. H. Hyman (Hudson Co. Soc.). H. B. Van Dorn (Monmouth Co. Soc.). S. I. Callahan (Southern Co. Soc.). W. A. Abbott (Atlantic Co. Soc.). Charles L. Moore (Plainfield Soc.). Joseph Ross (G. V. Black Dental Club). F. C. McLean (Passaic Co. Soc.). Paul S. Gobel (Ocean Co. Soc.).

State Board of Registration and Examination in Dentistry—Dr. C. Alfred Hane, Jersey City (five years). Dr. C. M. F. Egel, Westfield (three years). Dr. Richard S. Hopkins, Newark (two years). Dr. Arthur L. Westcott, Atlantic City (one year).

(The last three gentlemen named were elected in conformity with the requirements of the new dental law providing for three additional members upon the board.)

The meeting then adjourned until the evening session at 8 o'clock.

Thursday—*Evening Session.*

The Thursday evening session was called to order at 8 P.M. by the president, Dr. Barry.

Dr. Barry introduced as the essayist for the evening session Dr. W. H. O. McGehee, Cincinnati, Ohio, who read a paper entitled "A Rational Appliance for the Correction of Palatal Defects, Based on Original Studies of the Action of the Muscles of the Soft Palate."

[This paper is printed in full at page 1325 of the present issue of the Dental Cosmos.]

Discussion.

Dr. Otto E. Inglis, Philadelphia, Pa. My invitation to discuss this paper is perhaps more in the nature of a compliment to myself than to the writer of the paper. My interest in this subject has developed from a pathological standpoint, for I have not taken any practical interest in the making of appliances of this sort.

As you are aware, these malformations date from a period previous to the eleventh week of fetal life, when these openings should be closed naturally, and are due to the fact that the horizontal processes that form the horizontal plates of the superior maxillary bones, the palate bones, the velum, and the uvula are arrested in their development. The defect ranges from a small cleft of the uvula or of the soft palate to a combination cleft of the soft and hard palates, and even to hare-lip, and in very rare cases failure of lateral union causes fissure or even double fissure of the face.

Perhaps the first great interest in the study of the subject was awakened in the dental profession by Dr. Norman W. Kingsley, whose name should never be omitted from any discussion of this subject. Since his time, other men have added items of great interest in the practical construction of these appliances.

I have had to do with a few children who have been so unfortunate as to have this defect, and I have noticed that there is also a psychological effect produced upon them. In other words, this defect leads to ridicule by their fellows, and produces a peculiar mental attitude on the part of the sufferer. Anyone, therefor, who is able to construct appliances for the relief of these patients certainly confers a boon upon them. I take great pleasure in testifying my appreciation of what Dr. McGehee has done in the

construction of this movable and apparently very adaptable appliance. I certainly think he has conferred a benefit upon dentistry and upon humanity.

Dr. Joseph Kusey, Newark. We are again brought face to face with the fact that more and more, as time goes on, must the dentist take his place as guardian of the public health, with the same status as our brother the physician. The field of research work along dental lines in operative procedures and in therapeutics is forever broadening, and we are continually reminded of that now famous prediction of Dr. Charles Mayo, that the future of preventive medicine must be worked out by the dentist.

And now comes this new thought in prosthesis. I was indeed surprised to learn from the essayist's paper of the limited knowledge that is to be gleaned from the leading anatomists and physiologists, of the action of the muscles of the soft palate. I believe a minute knowledge of the action of the muscles of the soft palate in deglutition and in speech to be absolutely essential in order that we may properly and effectively correct cleft palate. Considering the seeming lack of intimate knowledge of this subject on the part of our leading anatomists and physiologists, it is all the more creditable to the essayist that he has brought these facts to our attention.

Dr. V. E. Mitchell, New York. As I am not a member of this society, it is a special pleasure to hear and discuss this paper, because there are few men in the dental profession who are doing any work along this line.

Whenever I hear of anything new in this work, I am anxious to find out all about it. As you know, I have made a special study of this subject for some years, and exhibited to your society, two years ago, a new appliance for the correction of this defect, and presented a patient to show the possibilities in the improvement of voice and speech.

The most important item that Dr. McGehee has brought to our attention is the fact that very little study has been given to the functions and the muscular action of the soft palate and adjacent tissues or organs. Most appliances that have been devised up to recent years have been constructed with little or no regard for the functions of the soft palate. I think I emphasized this very forcibly two years ago. At that time I did not show lantern slides or read a paper on this subject; I was merely given an opportunity to present a patient, and to show the results which it is possible to obtain in voice and speech with a properly constructed appliance.

"The proof of the pudding is in the eating." The one reason why I have said so little about the anatomical or theoretical side of this matter is that I do not think these observations to mean much to a body of men so few of whom have an intimate knowledge of the subject. It is results that you are most interested in.

The two important aims in the correction of this defect are (1) improvement of general health and (2) improvement of voice and speech. It is for the latter reason that patients come to us for help. The palate is one of the most important organs concerned in speech. Dr. McGehee has shown its delicate muscular action. But the soft palate is only a part of the voice or speech mechanism, and in any attempt to correct a defective palate, the functions of other organs must be taken into consideration.

Dr. McGehee has worked along lines somewhat different from mine, I having studied the problem from the point of view of the voice. I consider that the nasal passages should be restored to just as near a normal condition as the roof of the mouth or the soft palate. The nasal spaces have just as much to do with the voice and its resonance as the oral cavity or the larynx.

My appliance was constructed with that principle in view. I am glad to see that Dr. McGehee uses hard rubber exclusively. The making of hollow rubber appliances is a very simple matter by the method that has been taught in the textbooks for years. I suppose Dr. McGehee will agree with me.

This subject covers a great field. I

probably could not do justice to it in several hours. There is one more point, however, that I should like to speak of, and that is the muscular arrangement of the soft palate and other tissues of the speech mechanism. I do not know whether Dr. McGehee has read a treatise by Dr. L. Warnekros of Germany, who has written very extensively on this subject. I think the treatise referred to was published in 1909. He lays great stress upon the superior constrictor pharyngis, and justly so, because the more we see of these cases of cleft palate, the more we can understand the function of these muscular tissues.

Dr. H. J. Kauffer, New York. In introducing an obturator in the mouth of an adult who has been accustomed to articulate without the closure of the cleft there is one very important consideration. The use of these muscles is physiological. No matter what closure we may make of that cleft, these muscles will functionate as they have been accustomed to do. In cases of early operation as suggested by Brophy, after a very few weeks of life, this is overcome. I think a great deal can be done along the lines followed by Dr. Miller of New York, who is teaching sublingual articulation. I have seen and heard patients of his who articulate and enunciate most clearly, some of whom have even lost the tongue.

The use of the obturator is certainly essential, and the apparatus which the essayist has brought before us tonight is, I believe, the most complete I have seen, but I do not believe that we shall ever attain a good enunciation in a series of cases by the use of the obturator, for the simple reason that these muscles to begin with, if atrophied, have lost their function, therefore the patients have become accustomed to using them in an incorrect manner. I will illustrate: If I had endeavored to raise my hand in this way [illustrating] all my life, and suddenly some support or holder was put on that hand so that when I attempted to raise it I raised it in that way [artificially], naturally I would continue to attempt to raise my hand directly up, and that principle will always be found in the obturator, due to this physiological movement of the muscles, which is very difficult for the patient to overcome.

Dr. S. De Sola, New York. I have listened with great interest to Dr. McGehee's paper, and I congratulate him on his able presentation of the subject. I wish only to add that I have seen some of the work done by Dr. Mitchell which he presented before the First District Dental Society of New York in the course on mechanical dentistry some time ago. Dr. Mitchell's endeavor is, by means of his appliance, to correct the pronunciation or the enunciation of the patient, by restoring the nasal chamber and passages, so far as they can be restored with appliances. He presented a patient who first talked without the appliance and afterward with it, and that patient's enunciation was remarkably better with the appliance than without it. This patient also showed that he greatly appreciated the work Dr. Mitchell had done, because he said, "I would not be without this appliance any time of the day."

An important point that Dr. Mitchell neglected to speak about tonight was the clever device constructed by him, namely, the application, to a soft, small, rubber nipple, of a rubber shield that closes the cleft and enables one easily to feed babies in the first period, when it is impossible or not advisable to perform an operation. This appliance enables the child to be nourished for some time previous to the operation. I mention this appliance as a matter of information, as it is so helpful for young, inexperienced or unfortunate mothers to know that a child with congenital defect does not have to be taken immediately into the operating room.

Dr. Kingsley's appliance was greatly praised in his time, but considerable advancement has since been made, as has been demonstrated tonight by the essayist.

Dr. McGehee (closing the discussion). I wish to thank you for the cordial reception accorded my paper. I am especially grateful to Dr. Mitchell of

New York, and I want to discuss this subject with him before leaving Asbury Park. As I understand his work, he stands alone, especially in regard to the restoration of the resonance of the voice. I have never seen any of his appliances, but I am sure that whatever he attempts to do with his appliance, he accomplishes. I understand that he claims that the restoration of the vomer is largely concerned with the resonance of the voice, and in some manner, with the technique of which I am not familiar, he makes an artificial vomer which is attached to his appliance.

It has been a great pleasure to be here as your guest, and I hope I may have an opportunity to come again to see you. I wish I could take the hand of every member of your society, and thank you for the very pleasant, wholehearted reception which you have given me.

Dr. WALDRON moved that a vote of thanks be extended to Dr. McGehee and all who took part in the discussion. (Motion carried.)

The society then adjourned until the Friday morning session.

FRIDAY—*Morning Session.*

The meeting was called to order on Friday morning at 10 o'clock by the president, Dr. Barry.

Dr. Barry introduced CHRISTOPHER C. BELING, M.D., Newark, N. J., who read a paper entitled "The Relation of Dentistry to Neurology."

[This paper is printed in full at page 1360 of the present issue of the DENTAL COSMOS.]

As an introduction to his paper, Dr. BELING said: I highly appreciate the honor you have done me by extending me an invitation to present before your society a paper on "The Relation of Dentistry to Neurology."

The progress of knowledge made in our respective branches of professional work has been so great within recent times that it will not be possible for me, even were I equal to the task, to compass all that may be said under the title of this paper.

The mutual exchange of knowledge between the dental surgeon and the physician must necessarily result in better work, and in benefit to those who seek their aid. The object of my essay will have been attained if its presentation will advance such co-operation.

Discussion.

Dr. J. C. SALVAS, Philadelphia, Pa. The paper the essayist has so ably presented is indeed of absorbing interest. If we deliberate upon it, we cannot but feel the absolute necessity of being keenly alive to the fact that these obscure and complex conditions must be understood and treated intelligently, if the dental profession is to meet successfully the constantly growing demands of the medical profession and of the public. Our research workers have declared repeatedly during the past two years that arthritis, cardiac lesions, lesions of the kidneys and the joints, may frequently be traced to septic conditions of the roots of the teeth or contiguous tissues. There are also those deep-seated, obscure conditions expressed by pain in the head or face, in the ear, throat, and not infrequently the eye, any of which may be caused by some irritation of the dental nerve. These cases may sometimes baffle the most skilled diagnostician.

The essayist tells us that these conditions are generally due to other causes than the teeth and their environs, and that faulty diagnosis is responsible for the loss of a great many teeth. We acknowledge, and not without regret, that teeth have been ruthlessly extracted in the endeavor to correct conditions in which they had no influence. It is much easier and quicker to remove one or several teeth than to work along the lines of the more remote and deep-seated causes, moreover the operation of extraction is infinitely preferable to an injection for the relief of tic douloureux. But why sacrifice a tooth if it is not responsible for the tic douloureux?

Therefore the importance of a correct diagnosis—and with the aid of radiography there is little excuse for error. However, while systemic conditions are responsible for many of these troubles, the fact remains that the teeth and contiguous tissues are frequently the causative agents, and we as practitioners of a learned profession must be prepared to meet the situation. It is the deep-seated, obscure troubles that put the intelligent dentist on his mettle. It is not the simple, ordinary case of dental pain that confuses him. He is thoroughly familiar with every phase of this, because he meets with it daily and understands perfectly its various causes and how to correct it.

I will report three cases, each of which was due to an entirely different cause, but which are illustrative of the point in question:

Case 1. Mr. A., a strong, robust man, age forty-eight, was being treated by his family physician for indigestion. After two months, there being no improvement in his condition, he was sent to the seashore to rest. He returned after six weeks without having made any improvement, and with a very pronounced swelling of the spleen. When he was examined by the surgeon the swelling was of the size of a fist. The surgeons decided that, before any surgical measures were taken, the patient be turned over to a specialist on gastro-intestinal troubles. This physician worked with him for four weeks without any appreciable results. He then sent him to me with a history of the case, and requested me to make a thorough examination, and discover, if possible, any condition of the mouth that might be causing or contributing to his trouble. At this time the swelling was still present, and the patient suffered violent pains that attacked him late in the afternoons. On examination I found an unusual set of teeth, of a sanguinous type, perfect in structure, and without a filling. But he had pyorrhea alveolaris in its worst form. The upper and lower molars and bicuspids wabbled in pus-filled sockets; the anterior teeth, while affected, were not nearly so bad. I removed all of the molars and bicuspids, and instituted treatment for the remaining teeth. I treated the patient daily for a week, then every third day. At the end of three weeks he reported to his physician as a very different man. The swelling had disappeared, and his digestive and intestinal disturbance was entirely corrected. This occurred considerably over a year ago. He is now wearing an upper and lower partial denture, and his anterior teeth and surrounding tissues are perfectly healthy.

Case 2. The patient, in middle life, had been suffering periodically for several years with pain in the upper right side of the face. Her physician reported that the attack would come on every few months, but each time he was successful in controlling it. The attack would last for two or three days, and then disappear. At this time the family dentist was consulted, but assured her that there was nothing in the mouth that was causing or contributing to the trouble. The attacks subsequently began to appear more frequently, lasted longer, and were considerably more severe. They would come on several times each day or during the night, the paroxysms of pain becoming so severe that the patient was almost frantic. Her physician consulted with the surgeon to decide whether to operate or to institute alcoholic injections. The latter was to be tried first, as any other surgical treatment would mean a major operation. The surgeon, however, urged that the mouth and the teeth be thoroughly examined, not by one dentist but by several, so as to be as nearly certain as possible that they were not involved. With a detailed history of the case, the physician brought the patient to me. A careful examination was made of everything in sight by the various diagnostic means of locating interior troubles, but there was nothing to arouse the slightest suspicion. I then had several radiographs taken, and with the co-operation of three gentlemen who had had considerable experience in reading skiagraphs, I endeavored to find the trouble,

if there was any. There certainly was no pus, no blind abscess, no necrosis of the periapical tissues; in fact, we could see nothing that involved the teeth. An expert anatomist, an oral surgeon, however, said at once that there was cemental hyperplasia at the apex of the first molar root that was producing pressure on the superior dental nerve. He urged the immediate extraction of the tooth. The patient willingly consented, and the tooth was removed. That was the end of her suffering, the tic douloureux disappearing. If there is one thing more than another that we learn from an experience of this character, it is not only the value of the skiagraph for diagnostic purposes, but the importance of its proper interpretation.

Case 3. The patient, a man of forty-five years, presented himself for examination, remarking, as he took the chair, "I don't know that I have teeth, they are so perfectly sound. I wish I could say that of my ear." I found on examination that he had but two fillings, in the lower right and left third molars. The cavity margin in the lower left molar was defective, there being an opening large enough to admit the point of an explorer. On drilling into it I was surprised to find the entire filling undermined. I removed it and found an exposed pulp, which I anesthetized and removed at the one sitting, subsequently placing-in a dressing. I arranged for another appointment some days later. The second day following, the patient called me by telephone and asked if I thought the tooth which I had treated had been causing the trouble he had been having in his ear. I said it was very likely, and asked him to tell me more about it. He said in part, "I have been in the hands of an expert ear doctor for eight weeks, suffering, not an agonizing pain, but an annoying pain in the ear and down the neck. It would always appear in the morning when I arose, and again through the day, sometimes more severe than at others. I could not motor nor play golf with any pleasure. Since you worked on the tooth, the trouble has completely disappeared." From the dentist's point of view there is nothing unusual in this case, because we meet with such conditions frequently. The fact that he felt no pain in his teeth completely deceived both him and the doctor, although that was no excuse for the doctor.

Dr. Edward L. Wharton, Newark. Dr. Beling's paper should be a spur to the dental profession. He is a physician, and yet he has exhibited a remarkable knowledge of oral conditions. If we are to be known as stomatologists or specialists in one branch of medicine, it is obvious that it is our duty to learn more of the other branches of medicine bearing on neurology and other subjects. I have never yet heard a medical man go into the subject of dentistry with the same thoroughness as Dr. Beling. He even has gone into parts of our technique, advising us to line cavities with non-conducting substances, and appreciating the value of other practices, which we know but sometimes do not follow out. I wonder how many of us here know the finer points of the other specialties of medicine?

I once heard Dr. Beling say that there are three main factors which interest him about his patients—the blood, the urine, and the teeth. These three factors he placed above all others. If his assumption is correct, it is absolutely necessary for us, when a case is referred, to collect data concerning these conditions by an intelligent examination. I have always contended that neuralgia is the lazy dentist's excuse. There is no question that the great majority of neuralgic troubles are caused by the teeth, but patients are often lightly dismissed by the dentist with the consolation, "Oh well, it is neuralgia; you will get over it."

I had a patient present himself at my office some time ago suffering with severe neuralgic pain. He had consulted his dentist some time previously, and had been told that there were no cavities in his teeth. The dentist was right; but after a careful examination of this patient's teeth, my attention was centered upon a gold inlay. After the removal of

this inlay and devitalization of the pulp, the trouble stopped. From such examples it clearly appears that we have to make a thorough examination for more than cavities and Riggs' disease. Physicians want to know in what condition the mouths of patients referred to us really are, and we have to determine whether every pulp is in a healthy condition. We may have to use the radiograph in some cases. We have also to determine the patient's ability to masticate his food properly. The condition of bridges in the mouth is another matter of great importance, because very often, despite perfect mechanical construction, bridges are extremely unsanitary. Dr. Rhein has said, "In the near future, there is going to be a great return to plate work; something that we can keep clean."

Dr. Paul Livingston, East Orange, N. J. There are just two conditions upon which I would like to say a few words. Dr. Beling has so thoroughly covered the ground that he has left scarcely anything more to be said on the subject.

The two conditions which I have referred to are the so-called neurasthenias and the polyarthritic cases. The first group of cases includes that familiar class of patients who often complain of general asthma, headache, neckache, backache, joint-aches, great depression, insomnia, loss of appetite, fetid breath, internal tremors, etc. This form of neurasthenia is generally due to some autointoxication, either intestinal in origin or due to absorption from some foci of pus, either in the tonsils, teeth, or some other location. The cases which are of particular interest to you are those of neurasthenia caused by pus absorption due to Riggs' disease. It is a well-known fact that some people can digest pus without any untoward efforts whatever. This is observed in persons who are in perfectly good health though pus is exuding from around the necks of all their teeth. In contrast to these cases we observe grave and very prominent symptoms caused by a moderately severe Riggs' disease. These patients cannot tolerate pus absorption, and, when examining them for the causative factor of their condition we are very apt to overlook the condition of their teeth, the very cause of their trouble. I have one case in mind which will illustrate this very nicely.

A woman, age thirty-four, married, mother of one child, came to my office complaining of the following symptoms: Headache, neckache, backache, joint-aches, pains radiating down her shin-bones, internal tremors, great mental depression, general asthma, loss of appetite, and foul breath. Upon physical examination, I found a moderately well developed woman. The chest was negative; the abdomen, negative; kidneys, negative. Upon examination of her mouth I found very marked Riggs' disease. I immediately advised the patient to have her teeth and gums treated for pyorrhea by a good dentist, and put her on forced feeding, prescribing general and nerve tonics, with rest in bed. An autogenous vaccine was made and injected. The patient's pains have almost entirely disappeared, and she is feeling very much improved.

The other group of cases are those of the polyarthritic type, due to pus absorption. It has been clearly demonstrated that a large number of chronic joint conditions are local manifestations of pus absorption; also, that instead of the predominating feature being the complex of neurasthenic symptoms, the painful and tender joint conditions stand out with prominence. A case which I have now under treatment together with Dr. Beling will serve to illustrate my point:

The patient, age forty-six, weighing 165 pounds, single, a school teacher, has a negative family history; her previous medical history is a very important and interesting one in so far as it has great bearing on this case. Besides the fact that she has had to be treated constantly to prevent progress of pyorrhea alveolaris, she had had three attacks of infection of the antrum of Highmore, with pus running from her right nostril in great quantities. The last attack oc-

curred in 1913, and required a year before a cure was accomplished. During the progress of the treatment of the last infection of her antrum, while she was taking gymnastic lessons and going through strenuous exercise, she found that her back began to pain her, and she thought she had taken cold. She has had pains and discomfort ever since that time. The pains radiate from the lower lumbar vertebral region and extend down the thighs. Great pain is experienced on pressure over the first, second, and third lumbar vertebræ. She had also had other joint involvement. She has a history of painful and tender elbow- and knee-joints, having been laid up in bed for weeks at a time. The patient also shows enlarged and painful finger-joints. As you see, this is a clear case of polyarthritis caused by pus absorption, in spite of the fact that her case was diagnosed early as Pott's disease by a competent X-ray man. This case only goes to show that the sooner we recognize that diseases of the teeth and allied structures have a great influence upon the general system, the more benefit we can insure our patients.

Dr. Beling (closing the discussion). Mr. President,—I have not much to say in closing this discussion, except to thank you for the opportunity afforded me to present this paper. I came here with the object of learning something from you that may be of value to us in our work. The discussions this morning have been very helpful, and if this paper should bring about more co-operation between members of the dental and medical professions, I am sure I should be more than repaid.

I think Dr. Salvas has emphasized the importance of careful study and interpretation of what we find as the result of our investigation. This applies equally to both the medical and dental professions. The trouble is that we are satisfied with imperfect work, and, may be for want of time or for many other reasons, we do not go minutely and efficiently enough into the histories and symptoms of the patients who come to us. Dr. Livingston has mentioned a case, which is a very interesting one. When I first saw her, the symptoms seemed to point to a disorder of some of the glands of internal secretion. She had a general dilatation of the peripheral bloodvessels, disordered cardiac action, and mental symptoms; she suffered excruciating pains, particularly in her lower extremities, which led us to diagnose the presence of a lesion of the spinal nerve roots. The final result of our investigations led us to the conclusion that she was suffering from the remote effects of oral sepsis. I have had much co-operation from Dr. Wharton, who has examined and treated a number of patients for me, and I wish to thank him for the assistance he has given me. I am sure that if we physicians and dentists get into closer touch with each other we shall be able to solve some at least of the obscure problems that now confront us.

Dr. Knef. I move that a vote of thanks be tendered to Dr. Beling and the other gentlemen who have so ably discussed this paper—a rising vote of thanks.

The motion was seconded and carried.

The next order of business was the reports of officers and committees of the society.

The President. We will now hear from the Memorial Committee, Dr. Geo. T. Moore, chairman.

Report of the Memorial Committee.

Whereas, Almighty God in His infinite wisdom has seen fit to remove from the scene of his earthly labors Dr. Edwin O. Peck; and

Whereas, the New Jersey State Dental Society, of which he was a founder and an honorary member, desires to record its appreciation of him as a man and its sense of sorrow at his death; therefore be it

Resolved, That the sincere sympathy of the New Jersey State Dental Society be extended to the family of the deceased, and that this resolution be spread upon the minutes and a copy be sent to the family.

Whereas, Almighty God in His infinite wisdom has seen fit to remove from the scene of their earthly labors Dr. M. WHILLDEN FOSTER and Dr. LOUIS JACK; and

Whereas, the New Jersey State Dental Society, of which they were honorary members, desires to record its appreciation of them as men, and its sense of sorrow at their death; therefore be it

RESOLVED, That the sincere sympathy of the New Jersey State Dental Society be extended to the families of the deceased, and that this resolution be spread upon the minutes and a copy be sent to the families.

RAYMONDE C. ALBRAY, *Chairman*,
JAMES I. WOOLVERTON,
EDWARD L. WHARTON,
Committee.

Whereas, Almighty God in His infinite wisdom has seen fit to remove from the scene of their earthly labors Dr. T. T. WILKERSON, Dr. J. F. CRANDALL, Dr. H. D. GIHON, Sr., Dr. E. H. WEBB, Dr. ROBERT WAKEFIELD, and Dr. T. J. HOGAN; and

Whereas, the New Jersey State Dental Society, of which they were members, desires to record its appreciation of them as men and its sense of sorrow at their death; therefore be it

RESOLVED, That the sincere sympathy of the New Jersey State Dental Society be extended to the families of the deceased, and that this resolution be spread upon the minutes and a copy be sent to the families.

GEORGE T. MOORE, *Chairman*,
F. W. FRENCH,
GEORGE H. HOLDEN,
MARCUS STRAUSSBERG,
J. S. VINSON,
Committee.

The Membership Committee, Dr. H. B. Van Dorn, chairman, reported sixty-three applications for membership, and these were elected to active membership in the society. In addition to this, thirteen applications were presented for non-resident membership, and these applicants were duly elected to non-resident membership.

The next order of business was the installation of the newly-elected officers for the ensuing year.

Dr. GELSTON. I think there should be an Indigent Committee appointed. The committee was permanent, but the *personnel* was not. I would suggest that President Fowler appoint this committee before adjournment.

Dr. FOWLER. I will act upon that suggestion.

Dr. DAVIDSON. I move that a rising vote of thanks be extended to the retiring president, Dr. Walter F. Barry, for the service he has given to this society. (Motion carried.)

Dr. BARRY. There has been a question brought to my attention in regard to the trust fund of the Indigent Dentists. It seems necessary that we continue this committee in order to meet with any contingency that may arise in reference to the fund which is already in our possession. I therefore move that this trust fund committee be retained and that they remain intact as a committee until such time as they are discharged, with the exception of the chairman, who shall be Dr. Arthur R. Slade of Millville. (Motion carried.)

Dr. HOPKINS. I move that the secretary be instructed, under the seal of the State Society, to extend the thanks of this society to all those who have extended courtesies to our organization, and to write a letter of thanks to the various gentlemen who have attended this convention and who have in any way contributed to the success of the convention of 1915. (Motion carried.)

Dr. FOWLER. If there is no further business before the convention, a motion to adjourn is in order.

On motion, adjourned until the next annual meeting.

DENTISTRY AND THE WAR.

AMERICAN AMBULANCE HOSPITAL—DENTAL DEPARTMENT.

First General Annual Report, for the year September 1, 1914—September 1, 1915.

By Dr. GEO. B. HAYES, Chief Dental Surgeon.

In his letter transmitting the foregoing report for publication, Dr. Hayes appends the following note:

"I have just been reading an article entitled 'The American Ambulance Hospital at Neuilly. An appreciation by Dr. Harvey Cushing, Professor of Surgery, Harvard Medical School, Cambridge, Mass.' On page 5 of that article Dr. Cushing says, 'All of the surgeons in attendance are men of outstanding rank in the profession, and some of the work of a newer order, like that performed by the dental surgeons, has been an object lesson beyond praise.'

"Dr. Cushing served at the Ambulance as chief surgeon of the Harvard Surgical Unit, and his appreciation of the work of the dental department is most highly esteemed and carries influence."

September 1, 1915.

To the Medical Board of the American Ambulance:

Gentlemen,—I beg to submit the following summary report of the principal operations performed during the year just finished. This list is far from being complete, no mention being made of the great number of treatments necessarily involved in work of this kind, and I regret to say that a very considerable percentage of operations were not recorded, owing: first, to the great and constant press of work which has kept steadily increasing, without relaxation, since the beginning; second, to the lack of early assistance and to insufficient organization, the quantity and character of the work having far surpassed all early conception.

The installation, from one dental chair alone at the start, has grown to number eight, with two dental laboratories. The staff includes eight dental mechanics, three apprentices, two nurses, seven auxiliaries, and a typist, involving a total of thirty-two persons in the department. At one time, in the month of May, over one-fifth (125 exactly) of the wounded in the Ambulance were under treatment for fractured maxillæ, and in addition to the 560 beds in the Ambulance, the department was taking care of its own convalescent patients returning from eleven outside hospitals.

Aims. It has been my aim and effort to offer to each wounded man at least, before leaving the hospital, dental treatment including prophylaxis of the mouth, extraction of broken-down teeth, necessary fillings, and the substitution of artificial teeth whenever necessary for sufficient mastication or the correction of a visible deformity.

Hindrances. Several factors have interfered seriously with the complete realization of this ideal:

(1) The extraordinary amount of work required, due to previous neglect—only a very small percentage of the wounded having ever visited a dentist except for the extraction of an aching tooth.

(2) The considerable demand for treatment on the part of the *personnel* of the hospital, including the field ambulance and special cases referred to us particularly from hospitals without a dentist.

(3) And mainly, the unprecedented number

of fractures of the maxillæ, the gravity of these fractures involving daily and prolonged treatment; approximately one-half of this number being tardy arrivals, healed of infection, but, from lack of dental intervention, with vicious consolidation and deformation of the remaining parts, necessitating reduction either by section or by the application of gentle force with complicated apparati. For the past eight months, fully one-half of the time has been taken up by this class of treatment.

Cards and records. Each patient is furnished an appointment card as soon as he is convalescent, offering him dental services. This card, in charge of the nurse, remains with his papers, and indicates that either—(1) he has refused dental treatment, or (2) that on examination he required none; or (3) that his dental treatment is terminated; the dates of appointments indicating whether or not he is going regularly to the dental surgeon. Records on separate cards are kept of all operations. When of sufficient interest, photographs are taken, as well as radiographs, impressions and plaster models made, which are filed, together with the patient's history, diagnosis, and record of treatment.

Visits to the wards are now confined to cases of suffering, of urgent treatment, or of special call for consultation.

Expenses. For the first two and a half months, all the expense of furniture, instruments, and supplies was borne by private contribution, and until the establishment of the laboratories, all of the mechanical work, for five months, was done free of expense to the Ambulance. Several private individuals have contributed to the outlay for photographic records, and a very large quantity of supplies and perishable instruments has been contributed by no less than eight dental furnishing houses in America, thus reducing the actual expense far below the cost represented.

Materials. All materials used have been of best quality, and particular and extra effort has been made to give the work a durable nature. Except in a few instances, and at private expense, no gold was used up to the establishment of a "Gold and Platinum Fund."

Laboratories. An enormous increase in the output of work and in time saved was obtained by the establishment of the dental laboratory. The number of dental splints, of special apparatus, and of regular artificial dentures made (averaging one denture to every four men), has only been made possible by the assistance of these trained mechanics, and I cannot do better than to insist on the important advantages gained by their mobilization for the purpose. Their services have been absolutely required for the accomplishment of this special work.

Auxiliaries. Another great step in saving of time has been the special appointment of one auxiliary nurse to each operator. This service, just short of professional in character, requires usually several months of training to become efficient, but, when thoroughly developed, means a saving of one-third of the operator's time in actual practice. At times monotonous and uninteresting, it has been rendered regularly with marked ability, devotion, and patience. The same may be said of the work of keeping the records.

Head nurse. The early appointment of a head nurse was a most useful and necessary expedient for the training and direction of the auxiliaries, for the supervision of dressings, the management of the wounded, and for general order. The department was fortunate in the selection for this post and owes much to the ability and tact with which these duties were performed.

X-rays. The X-ray department, while not equipped for the special work of dental photography, has rendered most valuable and indispensable service.

History. It is my belief that the distinction of being the first to have a dental surgeon on the medical board of a military hospital belongs to this ambulance. It was therefore with a keen sense of responsibility to you and to the members of my chosen profession that I accepted a task wherein lay such exceptional opportunity of useful service and educational benefit. My one aim and effort has been, aside from direct service to the wounded, to show the profession worthy of this new recognition and honor, and to demonstrate the necessity of its help. And it may well be a matter of extreme satisfaction to the board that, thanks to their kind assistance, this department has been able to demonstrate the immense possibilities of dental surgery, especially, as in case of this ambulance, where the work has been so happily carried out in collaboration with the general surgeon.

On learning of a movement to organize some kind of aid to the wounded by the American Hospital, I presented myself and offered my services on August 4, 1914, just as the committee were leaving to inspect the Lycée Pasteur. My appointment as dental surgeon soon followed, and I began planning for the care of 150 wounded. Within a fortnight enough funds were collected to warrant doubling the number of beds, and, feeling that alone I would be unable to care for that number, I requested the appointment of

my *confrère*, Dr. W. S. Davenport, and together we completed the installation of the dental department, bringing our own chairs, engines, instruments and supplies from a dental clinic which we had been conducting together for ten years.

There being no convalescents at the opening, we began by visiting the mouths of the patients in bed, accomplishing general prophylactic work with disinfection, treating such teeth as threatened trouble, and postponing further operations until the wounded might be able to go to the dental surgery. The single operating chair was used alternately, with visits to the wards, by both of us.

The fact of the existence of our dental department soon became known, as the English army, without a single dentist, quartered at Villeneuve—St. George's—early sought our assistance. Officers from the front on three days' leave of absence came to us for relief from dental troubles. Several telegrams were received requesting a dentist to be sent to the front.

Up to this time, no other ambulance had made provision for a dental surgeon, although both the French and English soon after began the organization of similar departments, and we had numerous visitors to take note of our installation and methods of work. Soon after, the cases of "fractured jaws," as they came to be commonly called, began to arrive, and a new branch of dental surgery and dental orthopedics came into existence.

Co-operation of general and dental surgeons. A new line of work, of creative work, began, which has brought the general surgeon and the dental surgeon into a mutual co-operation and interdependence such as never before existed.

Fractures of the maxillæ had been classified and their treatment defined, but no reference books could be found to record the treatment of the terrible devastation caused by the projectiles of modern warfare (trench fighting). Almost every case presented fractures with loss of substance varying from small pieces to half or nearly the whole of the mandible or half the face.

The study then began of what remaining fragments should be removed and what saved; means devised to maintain these fragments in their normal position during the healing process, and later, devices for restoring lost parts and building up a skeleton or frame for the final grafts and plastic work of the surgeon.

At this time, Professor Choquet joined us, bringing material aid from the École Dentaire de Paris. It is to his initiative that we all owe the first good photographic records and the early colored slides.

The scientific reports of these interesting and important cases will follow later, when they will have been duly classified, but, in this general revision, it may be fairly stated that the dental surgeons and dental mechanics have risen to the occasion, and the value of their work has been duly recognized. They have made it possible for a final plastic operation to return these mutilated wrecks to the world, not as objects of horror and commiseration, but as men presentable, happy, and fit to resume their places in society.

The lack of foresight and failure to create dental services generally began to make itself felt when the tardy arrivals (old cases) began to appear, sent to us for help, having passed beyond the general surgeons' sphere, cured of infection, but with mouths sewed up, faces distorted, mastication rendered impossible, and with fractured parts not only displaced, but healed, ossified or ankylosed in abnormal positions, making double the work of restoration and necessitating either radical surgical intervention or long and tedious treatment, for which devices had to be made, taxing to the utmost professional skill and ingenuity.

As the opportunity and demand for service increased, offers of assistance were gladly accepted, first from local *confrères*. Dr. Hotz became a member of the staff in late October, giving half of his time. Professor Potter, of Harvard University, was with us for three months. At his special request, Dr. Darcissac became mobilized with us. Dr. Ortion was with us for six weeks. Since the middle of March, Dr. Stuhl has given valuable assistance. The reputation and the character of the work attracted Dr. D. O. M. LeCron and Dr. Roberts of London, who contributed three months of skilled and faithful work to the service.

Then, in reply to requests from abroad, it was decided to give an opportunity to help to representatives of the various dental colleges in America. This decision was arrived at when it became a question of either limiting the number of "fracture cases" or of sending for help and converting the chapel into a second operating room. Your honorable board then "recommended, in recognition of the services rendered by the department, to increase its capacity and set aside four more wards for these special cases."

Limit to number of fracture cases. Consideration of the other surgical departments, it might seem, has been the only reason for

limiting the continued growth of this department, as material and assistance have at no time been lacking.

On July 1st, Professor Guilford, dean of the Philadelphia Dental College, with Dr. Dudley Guilford and Dr. Wass, together with Dr. Speakman, Drs. Lane and Cooper, and Mr. Lenzer, of the University of Pennsylvania, arrived, soon followed by Dr. Russell, oral surgeon, from Philadelphia, and Dr. Robert LeCron of London.

It is my pleasure to report a universal interest and devotion to the work on the part of the entire staff, and to acknowledge most courteous consideration and co-operation of the general surgeons.

Respectfully submitted,

GEORGE B. HAYES,
Chief Dental Surgeon.

Summary.

SEPTEMBER 6, 1914—SEPTEMBER 1, 1915.

Extractions	2658	Gold splint ...	1
Amalgam fillings	1345	Obturators	2
Cement "	627	Angle arches ..	4
Gutta-percha "	247	Pivots	10
Arsenic	192	Plates repaired.	9
Roots filled	399		
Pulps removed .	181	Total number of plates (vulcanite)	383
Wire splints ..	6		
Rubber " ..	14		
Metal " ..	88	(Incl. 1948 teeth	
Bridge " ..	11	replaced.)	

Cases of fractured maxillæ—

In hospital	94
Outside, still coming	46
Under treatment	140
Finished	104
Total	244
Cleansing and prophylactic treatments.	1279
Total cases treated	1523

STAFF AND PERSONNEL.

Dentists:

Dr. Hayes: Full time first 10 wks.; full time less 3 half-days per wk.

Dr. Davenport: Full time first 6 weeks—mornings.

Prof. Choquet: Mornings.

Dr. Darcissac: Full time; mobilized.

Dr. Stuhl: 3 half-days per week since March 15th.

Dr. Russell: Full time since July 1st.

Prof. Guilford: *Ditto.*

Dr. Dudley Guilford: *Ditto.*

Dr. Speakman: *Ditto.*

Dr. R. LeCron: *Ditto.*

Dr. D. O. M. LeCron: Full time April 1st to July 1st.

Dr. Roberts: *Ditto.*

Dr. Ortion: 9 half-days per wk. for 6 wks.

Prof. Potter: Full time Nov. 25th to Feb. 25th.

Dr. Hotz: Afternoons Oct. to April; 3 aft. per wk. April to June.

Mechanical Dentists:

Dr. Cooper: Full time July 1st to Oct. 1st.

Dr. Wass: *Ditto.*

Dr. Lane: *Ditto.*

Mr. Lenzer: *Ditto.*

Mr. Moore: Salary 200 fr. per month.

Mr. Paradis: Half time at 160 fr. per month, plus lunches.

Mr. Benneteau: Mobilized.

Mr. Morel: *Ditto.*

Apprentices:

Mr. Boireau: From March 1, 1915.

Mr. Duglet: From August 6, 1915.

Mr. Maurin: From May 19, 1915.

Head Nurses:

Miss Daly: From Sept. 1914 to Sept. 1915. One year.

Miss Edgers: From August 1, 1915.

Nurses:

Miss Flint, Miss Freund, Miss Grace, Miss Taylor.

Auxiliaries:

Miss Du Bouchet: From Dec. 16th to Aug. 19th. One year.

Miss Basanjon: From Dec. 1914 to Feb. 2d. 2 months.

Mme. Despecher: About 3 weeks.

Miss Hill: From Jan. 1915 to July 15th. 6½ months.

Miss Munroe: From March 13, 1915.

Miss Merlin: From May 15th to June 3d. About 3 weeks.

Miss Paumier: From May 18, 1915.

Miss Thrupp: From June 3d to July 28th. About 2 months.

Mrs. Guilford: From July 1, 1915.

Miss Craik: From July 9, 1915.

Miss L. Lawton: From July 13th to Aug. 10th. 1 month.

Miss Wittman: From July 16, 1915.

Miss Holland: From August 10, 1915.

Miss Parent: From August 16, 1915.

Miss E. Lawton: From August 19th to Sept. 1st. 2 weeks.

Miss Kent: From August 28th to Sept. 12th. 2 weeks.

Stenographer: Miss F. Levy.

Photographer: Mr. King.

DONATIONS.

Special Dental Fund.

Mr. W. H. Brevoort	fr.	500
Mrs. Draper-Colburn	"	100
Dr. Darcissac	"	100
Mrs. Nielson-Brown	"	250
Mme. Rodocanachi	"	500
Mr. de la Rue (£5.00)	"	135
	fr.	1585

Special Gold and Platinum Fund.

Contribution Mr. H. P. Davidson ... $1000

Gifts of Dental Supplies.

Roujoux & Zöllig, 16 rue St. Marc, Paris.
S. S. White Dental Mfg. Co., 12th & Chestnut sts., Philadelphia.
Consolidated Dental Mfg. Co., R. E. Trust Bldg., Philadelphia.
Blue Island Specialty Co., Blue Island, Ill.
J. W. Ivory, 21 N. 13th st., Philadelphia.
Detroit Dental Mfg. Co., Detroit, Michigan.
Lee S. Smith & Son, Pittsburgh.
Johnson & Johnson, New Brunswick, N. J.
The Atkinson Laboratories, 1200 Arch st., Philadelphia.
King Specialty Co., Fort Wayne, Ind.
L. D. Caulk Dental Co., R. E. Trust Bldg., Philadelphia.
Lincoln Dental Mfg. Co., 1215 Filbert st., Philadelphia.
Dayton Dental Supply Co., Dayton, Ohio.
Chas. P. Pilling & Son, 23d & Arch sts., Philadelphia.

Loan of Dental Chairs and Furniture.

Dr. J. W. Crane.
Dr. W. S. Davenport.
Dr. E. Darcissac.
Dr. Hayes.
Dr. Stuhl.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

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PHILADELPHIA, DECEMBER 1915.

EDITORIAL DEPARTMENT.

RE-DISCOVERY.

WE have on previous occasions endeavored to direct the attention of our readers to the tendency to repetition of ideas and the re-discovery of truths related to our professional work so constantly manifested in our periodical literature, and to no small degree in our standard literature as well. We seem to be constantly re-threshing the yearly intellectual product and extracting therefrom a grist of truth which, although for the uninitiated it may present the outward superficial appearances of the newly born, is nevertheless the "lean and slippered pantaloon" of ancient dental effort exploiting itself in infant guise for the edification of the ignorant. We have not only directed attention to the above-mentioned tendency, but have endeavored to show that it represents a vast bulk of misdirected energy, and what is of much greater importance, it constitutes a formidable obstacle to dental progress—that kind of progress which is the collective result of the intellectual growth and practical efficiency of the individuals composing the dental profession.

The records of the Patent Office abundantly show the extent

to which the tendency to re-discovery multiplies inventions. So multitudinous are the devices and so manifold the applications for monopoly of what inventors regard as original ideas that the first step prescribed by any attorney dealing with the protection of a presumably new invention is to make a search of the records in order to ascertain the state of the art and determine to what extent if any the idea under consideration is really new. If a similar course were pursued by writers, especially those who prosecute lines of original research and ultimately report their findings therein, much useless labor and not a few subsequent heartburnings would be avoided. Moreover, our scientific literature would be relieved of much padding in the shape of ancient truths rehabilitated in the outward garments of original scientific discovery.

The general truth of this situation in so far as it relates to material inventions is broadly recognized, but as related to the re-discovery of truths in general or applied science, by far too little attention is given, by those who are prospectors in the domain of original thought, to the necessity of knowing what has already been done. Too frequently, indeed, it would seem to be the case that each newly heralded discovery is but little more than a repetition or at most an extension of some previously discovered truth. It was doubtless the recognition of this fact that led Solomon to declare that there was nothing new under the sun. The development of truth takes place by a continuous process of evolutional growth. No truth is born full-orbed and complete. An idea containing the germ of a truth is announced, and years may elapse before it is freed from the imperfections and incompleteness which like swaddling-clothes have hampered its infancy. The dental profession has studied the problem of dental caries ever since dentistry had its beginnings in remote antiquity. The problem of its causation was largely solved when Miller gave to the world the results of his researches and announced his chemico-parasitic theory of tooth decay. Yet in 1530, in the first book separately published on the subject of dentistry, it is stated that—

> Caries is a disease and defect of the teeth in which they become full of holes and hollow, which most often affects the molars, especially if one eats and does not clean them of the adhering food, which decomposes, producing a bad acid moisture which eats them and corrodes them out, increasing continually little by little so that it destroys the teeth entirely, which thereupon finally rot away in pieces, not without pain.

Perhaps it is not too much to say that the utmost that scientific investigation into the causation of dental caries has thus far done is to demonstrate the scientific soundness of the doctrine enunciated at that early period.

Again, a more modern instance. No dental question is attracting such widespread interest at present as that of metastatic or focal infections in remote parts of the body having their origin in an infected mouth, with the related problem of the reflex disturbances, tissue changes, neuroses, psychoses, disturbances of the special sense organs, originating in peripheral irritations of the terminals of the trigeminal nerve. These problems are at present in the focus of intense scientific investigation; yet in 1865 J. W. Clowes, in a paper read before the Brooklyn Dental Society, said:

> "A dead tooth always has a discharge from it";—thus, less than two years ago. I thought and spoke and wrote, and the veracity of the statement was so fully impressed upon my mind that I commiserated the mental caliber that could not comprehend it. For over twenty years I had daily been accustomed to see dead teeth almost invariably accompanied by fistulous openings. Inflamed and ulcerated gums, neuralgia, impaired vision, hardness of hearing, and sore throats were too often the concomitants of this diseased condition. . . . I had learned from early personal experience that a nail and splinter are especially foreign to the toe or finger of a boy. What follows their occupancy even for a brief period of either of these parts? Soreness, festering, and flaw, or their synonyms inflammation, suppuration, and discharge. If the eyes of my patients were affected, I looked for the cause in one or more of the upper front teeth; if the facial nerves were unstrung, the bicuspids or molars were subject to suspicion; if the ear or throat complained, the wisdom teeth were accounted responsible.

This was before the days of bacteriology and of neurology, but have we not in the above-quoted lines the germ of all that is now being so thoroughly investigated from the scientific standpoint within the domain of focal infections and reflex irritations of dental origin? Was it not even the beginning of a realization of the necessity for scientific root-canal treatment?

Attention is again directed to these matters in the hope that it may stimulate a habit of study of the literature of a subject by the investigator before he rushes into print with his report and his direct or implied claim to originality, and incidentally relieve the stress upon our magazines arising out of the continuous demand for space for the publication of papers which at the best are but re-statements, and too often very imperfect re-statements, of ideas and truths already abundantly recorded in our literature.

Review of Current Dental Literature.

Conducted by RICHARD H. RIETHMÜLLER, Ph.D., D.D.S.

[*Muenchener Medizinische Wochenschrift*, April 27, 1915.]

PRINCIPLES OF COMBATING LOCAL INFLAMMATIONS IN THE MOUTH. By Dr. Otto von Herff.

The writer discusses the mode of action of disinfectants. Spores cannot very well be killed, since disinfectants injure the tissue cells too easily by forming compounds with the albumin, as, for instance, sublimate and other mercury preparations and silver salts. The germicidal power of the halogens—chlorin, bromin, and iodin—is quickly exhausted in wounds, because they destroy the albumins by abstracting hydrogen. Alcohol, the phenols, and the cresols penetrate the tissues but slightly; they do not combine with albumin, but precipitate it. The specific virulence of pathogenic spores can be reduced by mercury bichlorid. The far less toxic methylene blue-silver compound is preferable, however. The nutritive medium can be rendered less favorable for germ growth only by the growth-inhibitive, penetrating action of such disinfectants as do not form solid albumin compounds or decompose the albumins by uniting with them. Hence all metallic compounds and the halogens are eliminated. Alcohol and the phenols, especially carbolic acid, are better in this respect. Alcohol has the advantage of being less toxic, and its growth-inhibiting action is considerable. Carbolic acid precipitates albumin, but easily diffuses into the tissues. Its escharotic action can be rendered innocuous by subsequent application of alcohol. Owing to the danger of causing gangrene, aqueous solutions should not be used, but glycerin preparations containing at the most 5 per cent. of carbolic acid. The cresols and their compounds have very little penetrating power, because they are not readily soluble in water. This is regrettable, since their bactericidal power, especially that of metachlorcresol (phobrol) is very great, while their toxicity is low. Disinfectants have a certain bactericidal action only when in aqueous solution. Substances soluble in water lose their effect if introduced into non-aqueous solvents such as absolute alcohol. For this reason, alcohol is effective only when diluted, preferably to 70 per cent. Below 60 per cent. and above 80 per cent. its action is very limited, although even 5 per cent. alcohol still considerably retards bacterial growth. Tincture of iodin, according to the author, is not a reliable disinfectant; he uses instead a solution of one part of iodin to 1000 parts of alcohol, at from 50 to 60° C. The higher the temperature, the greater the bactericidal power, as a rule. Hydrogen dioxid is far more effective at 37° than at room temperature; it is advisable, therefore, to place it in a basin of warm water before using.

[*Lancet*, London, July 31, 1915.]

TEETH-GRINDING AND ADENOIDS. Editorial.

The *Lancet* editorially comments on a paper by Dr. Benjamins, published in the *Nederl. Tijdschrift voor Geneeskunde*, Amsterdam, 1915, vol. ii, p. 570, who both in the East Indies and Utrecht has noted the frequency with which the presence of adenoid vegetations in children is associated with the habit of grinding the teeth during sleep at night. In each locality he has dealt with 250 cases of adenoids, and he gives the following figures, based on the 500 cases, representing the percentages of the patients exhibiting the following signs of adenoids: Snoring 60 per cent.; catarrh 46 per cent.; deafness 41 per cent.; teeth-grinding 34 per cent.; aprosexia 33 per cent.; enuresis 32 per cent.; enlarged tonsils 25 per cent. Out of 325 of these cases, 47 per cent. were mouth-breathers, and 43 per cent. spoke with nasal tones. Among

all his patients, Dr. Benjamins counted 20 instances of epistaxis, 11 of bronchial asthma, and 8 of stammering. Operations for the removal of adenoids were performed on 55 patients with teeth-grinding, and 42 were cured of the habit, 8 improved, and only 5 continued to grind their teeth as before. The habit may be acquired, as he points out, very early in life. Two of his teeth-grinding patients were aged ten and twelve months respectively, each having four teeth in each jaw; the oldest patient was twenty-one years of age. The larger the adenoid growths in any case, the greater is the probability that the patient will grind his teeth; the enlargement of the tonsils, contrariwise, seems to be of little influence here, as it occurred in only 42 out of 172 teeth-grinding patients. The ages of Dr. Benjamins' patients were as follows: 11 were under three years of age, 106 were from three to five years, 219 were from six to ten, 130 were from eleven to fifteen, 26 were from sixteen to twenty, and 9 were twenty-one years or more. He believes that patients with adenoid vegetations exhibit an increased reflex irritability, and that it is this, rather than anything in the nature of carbon dioxid poisoning that makes them liable to nocturnal enuresis, teeth-grinding, and the like. In the case of teeth-grinding, he assumes that the receptive field, or point of departure, of the reflex lies in the mucous membrane of the naso-pharynx. The afferent path is through the glosso-pharyngeal nerve or the pharyngeal branches of the sphenopalatine ganglion. Neurons in the mid-brain presumably act as connecting links to set in action the motor nerve cells of the trigeminal nerve, particularly those supplying the pterygoid muscles.

[*American Journal of Surgery*, New York, October 1915.]

COLOR CHANGES AND THE MARGIN OF SAFETY IN NITROUS OXID ANESTHESIA. By Dr. D. H. Morse, Hemet, Cal.

With any anesthetic, Morse argues, the so-called margin of safety is a vague hinterland, bordered on one side by the primary stage of analgesia and semi-consciousness, and on the other side by coma, respiratory failure, and death. Beyond the threshold of conscious stimuli, these two extremes blend one with the other as do the penumbra and umbra of a shadow. In the closed system with nitrous oxid as the anesthetic, the depth of anesthesia is dependent on the oxygen supply. As the oxygen is diminished, the anesthesia is deepened, but the dangers also are directly increased. The best index for regulating the supply of oxygen and preventing anoxemia is the patient's color. In the color of the capillary blood as revealed by the mucous membranes, finger-tips and ear-lobes, we have a biological reaction of the greatest nicety. This is far more accurate than any mechanical contrivance for regulating the volume of percentages of the gases, since it has been shown by Lindhard and Hasselbach that the threshold of excitation of the respiratory center, as well as the nature and size of the stimulus, varies from time to time in the same individual. The oxygen demand is not a constant, but the real constant is the H-ion. The color of the capillary blood indicates with lightning rapidity the degree of dissociation of the oxyhemoglobin and the amount of carbo-hemoglobin present. Cyanosis means oxygen-lack, and carbon dioxid excess.

Unfortunately, nitrous oxid, by the very mildness of its depressant action, frequently compels the anesthetist to resort to accessory measures in order to produce a satisfactory depth of anesthesia. In this extremity he should never resort to even minimal grades of asphyxia. It is far better to use such methods as preliminary narcosis, local anesthesia, and the supplemental use of ether in small amounts. In some cases it may be necessary to combine all three of these measures. A dram or two of ether will usually produce satisfactory anesthesia in these cases, with no harmful effects. A most important factor, as Gatch has shown, is the surgeon himself. He should learn to work in the zone of very light anesthesia.

In conclusion, the writer states, the margin of safety in nitrous oxid anesthesia is a broad one, and the dangers are seldom due to the anesthetic or to acapnia. The real danger is oxygen-lack. This danger is especially great in patients with a tendency to acidosis due to faulty metabolism. The most reliable control of the oxygen supply is based on the patient's color. The warning sign is slight duskiness, pallor, or cyanosis. Rebreathing of carbon dioxid in small percentages, up to 8 per cent., is beneficial, particularly in cases

of surgical shock. It is safer to supplement nitrous oxid with other narcotics or local analgesia than to deepen the anesthesia by decreasing the oxygen supply.

[*Revue Trimestrielle Suisse d'Odontologie*, Geneva, No. 2, 1915.]

THE DESICCATION OF CAVITIES. By René Jaccard.

For the desiccation of cavities, which is an absolute necessity in order to insure adhesion of filling materials and to avoid recurrence of caries, the air-syringe with rubber bulb has been used for many years. This primitive instrument, however, has the following shortcomings: Time is lost in drawing in the hot air from a Bunsen burner or alcohol lamp. The first blast of air is burning hot, the second and third blasts are passable, but they already contain moisture from the patient's mouth, the subsequent blasts being so charged with moisture as to render perfect desiccation impossible. The patient's objection to the first very hot blast may cause a sudden defensive gesture and burning of the tongue or cheek. Some twenty years ago, the insertion of an electric light bulb in the air-syringe was suggested, and this appliance was used with fair success. With the aid of the modern compressed air-syringe, a considerable saving of time is effected, the temperature is constant, and the air entirely dry, especially if some calcium chlorid is placed in the compressor to absorb all moisture. The electrically worked compressor, of course, is preferable to the hydraulic one, as it can be regulated very easily and accurately from the switchboard.

[*La Odontología*, Madrid, June 1915.]

CONTRIBUTION TO THE PERFECTION OF METAL PLATES CAST UNDER PRESSURE. By Dr. A. Chornet.

Metal plates cast under pressure, in most cases, lack perfect adaptation to the mucous membrane, if made by the technique now in vogue. This faulty adaptation is due to the difficulty of adapting the wax to the plaster model and removing the wax plate without distortion, especially if there are slightly undercut portions in the model. This shortcoming the writer proposes to overcome by pouring the model in investment compound, constructing the wax plate on this model, and investing the whole in the casting ring. In this manner the technique is considerably simplified, and the plate will fit as accurately as a vulcanite plate, since the cast metal will be closely adapted to the conformation of the cast.

[*Therapeutische Monatshefte*, Berlin, September 1915.]

RELATIONS BETWEEN INTERNAL DISEASES AND DISEASE OF THE TEETH. By Dr. H. Euler.

That carious teeth may serve as portals of entry for tuberculosis and actinomycosis is a familiar fact. Euler had one case in which the track from the tooth to the tuberculous granuloma could be traced by the microscope, and a complete cure followed resection of the part of the jaw through which the track passed, and excision of the diseased lymph gland. Zilz has reported finding Much's granula in putrid fistulas at the roots of teeth. Diphtheria bacilli have also been found in carious teeth in otherwise healthy carriers. Neuralgic pain in teeth may develop from hyperemic pressure as a feature of the menstrual period, especially during the days just preceding the menses. The writer warns dentists not to be misled by this to extract the tooth, or do more than seek to allay temporarily the congestion and pain. Similar neuralgic pains may occur in the pregnant, but the main complaint is the rapid increase of caries during pregnancy. This may be due in part to the altered metabolism, to the changes in the composition of the saliva, or to neglect of proper dental care. The women may shrink from having teeth filled for fear of possible influence on the fetus from the pain endured. Euler adds that the fetus takes what it needs from the maternal organism and leaves to the mother the task of making up any deficit. It may be that the drain on her lime deposits may render the teeth more fragile and more susceptible to caries at this time. He reiterates that it is a mistake to assume that adults do not need lime for their teeth, and particularly during pregnancy.

Euler presents evidence that a special influence on the teeth may be noted in acute articular rheumatism, typhoid, and influenza. Snoek even speaks of "acute rheumatism of the teeth." Pulpless teeth, also intact teeth, may suddenly begin to ache during acute

rheumatism or convalescence, and there may be phenomena of periodontitis. This may occur also in typhoid with no local findings to explain it. It is possible, however, that neglect of the usual care of the teeth during protracted diseases may co-operate in this. The influence of influenza on the teeth is still more pronounced. Besides the neuralgiform pains, there may be suppuration in the pulp or gum below.

In all these and similar diseases, care of the mouth is of prime importance, the dentist to be called promptly when the infection in influenza spreads to involve the pulp, which usually does not occur until the general infection is on the decline. It may be wiser to extract the tooth than to let the patient continue to suffer. Weak heart action is liable to entail stasis in the peripheral circulation, and this is particularly liable in the teeth and may cause severe toothache, which may also occur from a similar cause in arterio-sclerosis. The patients may clamor to have the teeth removed, but the disturbances will not be arrested by this, but are liable to be aggravated, while there is especial danger of protracted bleeding and defective healing in just such cases.

Both the first and second dentitions may be accompanied by gastro-intestinal disturbances. Euler maintains that teeth require the supervision and care of a dentist regardless of whether they belong to the first or second dentition; also that the deciduous teeth, even if decayed, serve a useful purpose by keeping open a passage for the tooth to follow. With organic nervous disease, there may be neuralgiform pains and anesthesia or paresthesia in the cheeks, lips, and tongue; the teeth may drop out spontaneously; there may be atrophy of the alveolar process and necrosis of the jaw. Misch, in his work on the borderland between medicine and dentistry, cites authorities to show that there is a possible connection between disease of the teeth and insanity; we know that cretins often have deformed teeth. Alveolar pyorrhea seems to require both a local irritation and a predisposition. Besides the dentist's treatment of this condition, the physician should attack the underlying predisposing factors.

The trend of Euler's forceful arguments, which are given considerable space in the *Journal of the American Medical Association*, October 30, 1915, also the attention which public health authorities are beginning to devote to oral conditions, as for instance, *Health News*, the monthly bulletin of the New York State Department of Health, October 1915, in an editorial on "Dental Prophylaxis and the Public Health," are encouraging symptoms of the increasing appreciation of the concurrent rôles of medicine and dentistry in the safeguarding of communal health.

[*La Stomatologia*, Milan, April 1, 1915.]

A NEW HEMOSTATIC (COAGULEN KOCHER-FONIO). By Dr. A. Campiglio.

[*Oesterreichisch-Ungarische Vierteljahrsschrift für Zahnheilkunde*, Vienna, April 1915.]

HEMOSTASIS BY MEANS OF COAGULEN. By Dr. E. von Rottenbiller.

Discussing the coagulation of animal blood, Campiglio and Von Rottenbiller review the studies of many investigators, notably Kocher and Fonio, from which it appears that blood, as it flows through the arteries and veins of animals, contains several substances which under certain conditions combine with each other to cause coagulation, these substances being cytozym (thrombozym, thrombokinase), thrombogen (serozym), and thrombin (fibrin ferment). The last is a product of the combination of the first two, and the real cause of coagulation. The last two, throbogen and thrombin, are so sensitive to change of temperature, especially boiling, that it is not possible to separate them from the blood for practical use. Cytozym, on the contrary, may be exposed to a temperature of 100° C. without losing its activity. Kocher and Fonio have taken advantage of this fact to prepare from blood platelets cytozym in such convenient form as to render it fit for practical use in combining with the thrombogen to form the real active coagulant, thrombin, thereby increasing and accelerating the natural tendency to coagulation of blood. Coagulen is a yellowish granular powder with but slight odor, sweet taste, readily soluble in water or normal salt solution, and, when dissolved, may be sterilized by boiling for one or two minutes, without injury to its coagulating properties. Campiglio has found coagulen to be a valuable local hemostatic, simple of application, without appreciable effect upon blood pressure and absolutely innocuous to

the tissues. Another advantage he emphasizes is the possibility of applying it intravenously or by hypodermic injection. He finds an objection, however, in the necessity of preparing a fresh solution immediately before application.

Von Rottenbiller considers coagulen to be of great value in dental practice. Its application is simple and reliable and requires no technical skill or complicated apparatus, and is in accord with modern principles of asepsis. The preparation can be easily preserved, and fresh solutions are easily and quickly sterilized. From 5 to 10 per cent. solutions in normal salt solution have given best results in some 180 cases. Clinical experience shows that coagulen will not only arrest hemorrhage for a short time, but will, if applied correctly, prevent secondary hemorrhage. This is especially valuable in hemophiliacs. After the bleeding wound has been disinfected and freed of loose coagula, the solution is sprayed vigorously upon the bleeding vessel, which is closed by the thrombus formed. Extractions and minor or major oral surgical operations are thus considerably facilitated. In pronounced hemophilia, hypodermic injection of from 20 to 50 cc. of a 3½ per cent. solution has been found to be an effective prophylactic measure.

[*Ash's Monthly*, London, September and October 1915.]

THE PATHOLOGY AND TREATMENT OF PERIODONTAL DISEASE (PYORRHEA ALVEOLARIS). By Dr. N. N. Znamensky, Moscow.

In this voluminous and well-illustrated report, made before the Stomatological Section of the Seventeenth International Medical Congress, in London, 1913, the writer treats of the pathological anatomy of pyorrhea alveolaris, according to its etiology and the relationship existing between it and general constitutional disturbances, and the proper and most expedient methods of treatment of the disease, arriving at the following deductions:

The process in the bone in pyorrhea alveolaris is a rarefying osteitis, an osteoporosis, viz, a process of destruction of the bone and its transformation into a connective tissue infiltrated with white blood corpuscles. Osteoporosis is the general form in which bone is destroyed, and does not depend upon the cause from which the rarefying osteitis originated. Rarefying osteitis and atrophy of the bone in pathological anatomy are the same process of bone destruction. The whole difference between them consists only in the quantity of the white blood corpuscles in the soft connective tissue into which the bone has been transformed. Osteoporosis may be caused by local conditions as well as general constitutional diseases such as osteomalacia, rhachitis, scrofula, syphilis, acute eruptive conditions, fever, typhoid, diseases of the blood, metabolic diseases, anemia, chlorosis, scurvy, leukemia, hemophilia, diabetes, gout; the causes of atrophy of the tissues are scanty nourishment, repeated pregnancy, chronic catarrh of the stomach, diseases which exhaust the system, tabes dorsalis, tuberculosis, and rheumatism. Osteoporosis of the tooth sockets affords a very favorable soil for the development of pyorrhea; in itself it is not pyorrhea, as no pus is present originally. Lack of proper hygienic care of the teeth at the time of the above-mentioned disorders of general constitutional character, tartar deposits, stagnation of food between the teeth, bring forth a suppurating condition of the gums, which rapidly passes on to the ready soil of porous bone of the socket, to alveolar pyorrhea. Continuous suppuration from under the gum, caused by local conditions, gradually brings forth an osteoporous process, an alveolar pyorrhea. In slight cases of pyorrhea, when only non-medullated bone is affected, hygienic care of the teeth alone—such as removing tartar, washing with disinfectant and astringent substances—and a regular diet will suffice to suppress the ailment. When the pyorrheal process has involved medullated bone, it is necessary to curet the socket as the radical and quickest method of treatment. In destruction of more than two-thirds of the socket, well-developed diseases of constitutional character, especially tabes dorsalis and diabetes, contraindicate curetment. Besides local therapeutic measures, general treatment is imperative in such conditions. Among prophylactic hygienic measures for keeping the teeth clean, the chewing of solid food—for instance, crust of brown bread, and Caucasian or Siberian gum—is desirable as exercise for increasing the nutrition of the sockets and strengthening of the gums and teeth.

[*Zahnaerztliche Rundschau*, Berlin, August 15, 22, and 29, 1915.]

SARCOMA OF THE TONGUE. By Dr. Betke, Frankfurt a. M.

In his well-illustrated paper, Betke discusses sarcomata of the tongue, the really primary kind of which is a rare form of tumor. Lymphosarcoma is to be differentiated, as it represents a systemic disorder. Endothelioma, according to recent views, etiologically is to be classified with sarcoma. Sarcoma of the tongue may be either interstitial or pedunculated, and affects most frequently the posterior parts of the tongue. A differential diagnosis from other tumors is usually possible. In contrast to sarcoma, carcinoma of the tongue occurs by preference in youth, the relative frequency of occurrence being about the same in males and females. Even in extensive tumors of this kind, the mucosa remains intact remarkably often. The rate of growth varies greatly, and is most rapid in youth. Involvement of the glands is curiously rare. As for therapy, radical operation is best, though post-operative treatment with Roentgen and radium rays seems beneficial. Prognosis is comparatively favorable.

[*Journal of the American Medical Association*, Chicago, August 28, 1915.]

LUPUS ERYTHEMATOSUS OF THE MUCOUS MEMBRANES. By Dr. G. D. Culver, San Francisco.

The cutaneous lesions of lupus erythematosus are so deforming that they occupy the attention of both the physician and the patient to the exclusion of the manifestations of the disease on the mucous membranes. Furthermore, the lesions on the mucous membranes, although generally erosions, and therefore raw surfaces, do not usually give the same discomfort as do, for instance, herpes and mucous patches, hence the patient rarely minds them. They are important, however, in giving one an insight into the nature of the disease as being something more than a mere local cutaneous affection, and they are also important because it is occasionally necessary to differentiate them from other affections of the mucous membranes, especially those occasioned by syphilis. Culver gives eleven case histories of lupus erythematosus in seventeen locations on the mucous membranes. Only exceptionally are the gums in good condition, but commonly bleed easily. Gingivitis is almost constantly found. Redundancy or retraction is often marked, and the teeth are usually bad. The conditions are so constant as to point definitely to long-continued antecedency of gastro-intestinal derangements which have, in Culver's opinion, reacted on the gums and teeth. He concludes that the mucous membrane lesions are the result of general disease, and the manifestations of lupus erythematosus on the skin as well as the mucous membranes are only symptoms of a deeper pathological condition.

From the foregoing it once more plainly appears how valuable for the patient is an intimate co-operation between physician and dentist. From the dental point of view, Culver's opinion in regard to the gastro-intestinal derangements being antecedent and reflecting upon the mucous membranes, gums, and teeth, instead of *vice versa*, might well be challenged.

[*Zahnaerztliche Rundschau*, Berlin, May 30, 1915.]

THE MAKING OF GOOD PLASTER MODELS. By Dr. Carl Herber.

The observation that a plaster cast is most easily separated from the impression either immediately after the plaster has set or else a considerable time afterward, is due to the behavior of plaster, which immediately after setting becomes very hard, but soon softens again owing to its giving off, after setting, a large quantity of water which has become superfluous when the setting reaction is complete. Plaster, in order to set, requires, according to the writer, two molecules of water. Since it is technically impracticable to add exactly two parts of water to plaster, as it would not be soft enough, an excess of water is used. After the plaster, in the process of setting, has bound the necessary water of crystallization, a considerable quantity of water is subsequently liberated, impairing the integrity of the cast. In setting, plaster undergoes an expansion of 1 per cent., this expansion being greatest during setting, the heat of the setting process causing additional increase in volume. Attempts to overcome this expansion by the addition of various substances, chiefly aluminum salts, have

proved unsatisfactory; it seems best to avoid all admixtures.

The mixing is done best by pouring the water first in the plaster bowl and adding the plaster thereto until no water remains visible. Then an additional small quantity is added, which will at first remain dry, but will gradually absorb water. Little stirring is then necessary; the more vigorously and the longer plaster is stirred, the more it expands and the more slowly it sets. Impression plaster, of course, is mixed with more water, is stirred longer, and is hastened in its setting process by adding potassium sulfate or sodium chlorid to the water. As the impression and cast cannot be made simultaneously, and the impression is considerably smaller in bulk than the cast, the impression will harden far more quickly than the cast, which retains a great deal of water, and this is prevented from rapid evaporation by the covering impression. It is essential, therefore, to saturate the impression with water for five minutes, before pouring the cast, regardless of the separating medium used. In regard to separating media, the writer absolutely rejects soap solution, as it interferes with the setting of the cast by diffusing into the soft casting plaster, and produces a mushy surface layer. He uses either castor-oil, or preferably shellac solution (one part shellac in ten parts alcohol), which, however, must be applied only after the impression has thoroughly dried, else it will not enter the pores of the plaster, but form a superficial layer of uneven thickness. The shellac should be about as thin as pure alcohol, and two or three coats should be applied. As soon as the shellac has been thoroughly absorbed, the impression is painted with a solution of one part of sandarac in ten parts of alcohol. This solution also must be very thin, and care is to be taken to spread the liquid evenly, as it no longer enters the pores of the plaster. In this manner separating is easy, and the cast will have a smooth surface. The sandarac coating, of course, must also be allowed to dry perfectly, else the sandarac will glue impression and cast together. The perfectly dry impression is now laid in water for five minutes, first for the above-mentioned reason, and secondly in order to avoid osmotic action between the dry impression and the liquid casting plaster. The excess of water of the freshly mixed casting plaster would penetrate the separating medium, loosen it, and produce a smeary surface on the cast. The quality of plaster used is, of course, of great importance, and even good plaster may have been spoiled in transit by absorbing moisture.

[*Revue Trimestrielle Suisse d'Odontologie*, Geneva, No. 2, 1915.]

BUCKLEY'S DESENSITIZING PASTE. By Dr. Ch.-F. Pfaeffli.

The writer comments on Buckley's formula, which is given in the Dental Cosmos, August 1915, p. 854, and contains thymol and trioxymethylene—well known in regard to their actions, especially the latter in regard to its deleterious effect upon the pulp—and a proprietary anesthetic, neothesin. He gives fourteen case histories, and proceeds to enumerate his objections. The color of the paste is not well chosen, as in cavities of difficult access it is difficult to distinguish from carious dentin, and hard to apply accurately to the areas to be desensitized. There is great uncertainty as to the quantity to be applied, and equal uncertainty as to the depth of its action. Buckley states that his paste desensitizes by destroying the fibrillæ in the carious dentin in a certain zone underlying the place of application, but he does not state how far this certain zone extends. How do we know that sound dentin is not altered to such a degree as to affect sooner or later the delicate pulp, the destruction of which may proceed with extreme slowness and without notable pain? Has it really been established that every such destruction of the pulp is due to faulty diagnosis, and that the medicament is entirely harmless? Although the writer has not observed any untoward pulp condition, he believes, nevertheless, that further observations are necessary to arrive at certain conclusions. Although no other remedy applicable directly to the cavity has given such good results, nevertheless the action of this paste is not an immediate one, which deprives it of a cardinal feature. In cases demanding immediate operation, therefore, local anesthesia is the only method of choice. The writer considers as fully justifiable the sanguine hopes of the dental profession, but he is skeptical as to the "great benefaction to humanity," and advocates continued methodical observations.

PERISCOPE.

Method of Improving Polishing Strips.—If both sides of polishing strips are drawn over a piece of paraffin wax before using, they will work better and more rapidly, and will not be spoiled by moisture. This improvement is most marked in strips of coarse grain.—*La Odontología Colombiana.*

Cleaning Glassware.—Stained slides and glassware are readily cleaned by boiling for one minute in a mixture of equal parts of a 6 per cent. solution of sodium hydroxid and a 2 per cent. solution of calcium carbonate. The articles are then rinsed in cold water and wiped.—A. H. KAPLAN, *Journ. Amer. Med. Association.*

Removal of Broken Hypodermic Needle.—If a hypodermic needle breaks in the tissues, the operator should finish the injection and wait until complete anesthesia has been established. An incision of about 1 cc. length is made at right angles to the needle, which is then lifted with a hook-shaped excavator passed under it. A longitudinal incision is then made in the direction of the needle, and the fragment removed with pincers.—FRIEDEMANN, *Zahnaerztliche Rundschau.*

Taking Impressions in Persons Who Have Worn Plates Before.—It has been observed that, after a person has worn a plate, especially one of vulcanite, for some time, the mucous membrane swells slightly. This is the reason why new plates often do not fit satisfactorily in such cases. As the mucous membrane returns to normal condition within about twenty-four hours if no plate is worn, the patient should be requested to go without a plate for that length of time before a new impression is taken.—*La Odontología Colombiana.*

Replantation of Teeth.—If the alveoli are intact, the simultaneous replantation of all four incisors is successful. There is a possibility of the consolidation of a replanted single-rooted tooth, even if a large portion of the root-surface is restored by a porcelain inlay, and the corresponding alveolar tissue is missing; in such a case, the gum covering the inlay remains normal. If, in the replantation of molars, great resistance is encountered to the replacing of the tooth in its socket, local anesthesia should be resorted to and the patient asked to occlude the teeth, in order to utilize the traction power of the masticatory muscles.—A. CHIAVARO, *Dental Review.*

Dissolvable Impression Plaster.—F. Duijvensz recommends a mixture of two parts of potato flour and ten parts of plaster of Paris to make a dissolvable impression plaster. The potato flour must be very dry. The mix is made with cold water to which a pinch of table salt is added. After having been assembled, the impression is coated with a solution of one part of potassium or sodium silicate (water-glass) in three parts of water, and the cast is poured. After the cast has set, the impression is dissolved away in boiling water.—*Tijdschrift voor Tandheelkunde.*

Deaths from Anesthetics.—The annual statistics of births, marriages, and deaths, as published by the general registrar of London present the following interesting data: During 1914, 296 casualties were connected with or directly due to anesthetics, 13 cases more than in the previous year. In 111 cases the anesthetic is not specified. Of the remainder, 110 deaths were due to chloroform, 25 to chloroform and ether; 7 to alcohol-chloroform-ether sequence; 7 to nitrous oxid; 5 to ethyl chlorid; 2 to hedonal; 2 to cocain; 2 to alcohol and chloroform; 1 to stovain.—*La Odontología.*

Notes on the Insertion of Silicate Cement Fillings.—Time can be saved while a silicate cement filling is setting, if the rubber dam be folded over the incisal edges of the teeth and tied with floss silk. By this means the filling can be kept dry, and other work in the mouth can be proceeded with.

When inserting a silicate cement filling in an approximal cavity, where the space is too narrow for the employment of an agate or bone spatula, a perfectly efficient instrument can be readily prepared in a few moments by whittling a stick of hickory to the desired thickness. This wood is dense and supple, and it will be found to work perfectly for the purpose required.—*Edwards' Dental Quarterly.*

Danger of Tongue-Swallowing During General Anesthesia.—An observation is reported of a patient who was able to coil back his tongue in such a way that its tip actually entered into the postnasal space, occluding the air-passages. This was a voluntary maneuver undertaken to satisfy the man that he possessed mucous polypi, but such a readily movable tongue could easily be drawn back during the deep inspirations of nitrous oxid narcosis, and would cause serious danger, especially as the reason for the respiratory difficulty might be overlooked.—*Brit. Journ. of Dental Science.*

Fetor of the Breath.—Fetor of the breath can be combated by diagnosing its cause and removing it. Its source usually is the mouth. Carious teeth, pyorrhea, gingivitis, food débris in the interstitial spaces, tartar, unclean dentures, roots under dentures, must all be removed. Other causes are gray, viscous deposits on the tongue, usually due to bacteria, disease of the throat, especially putrefaction in the tonsillar crypts, disease of the nasal cavity and its accessory sinuses, diverticulum of the œsophagus, gastric or pulmonary troubles, tobacco, alcohol, and the acetone odor in advanced diabetes.—A. Albu, *Deutsche Monatsschrift für Zahnheilkunde.*

Treatment of Suppurating Wounds with Sugar.—To enable the operator to remove foreign bodies from suppurating wounds and to combat suppuration itself, Dr. Fackenheim recommends dusting the wound with powdered crystal sugar, tamponing the wound loosely with sterile gauze, and renewing this dressing every second day. The wounds cleared up within from four to six days. In deep putrescent fistulæ, gauze tampons impregnated with sugar, or lavage and dressings with sterilized sugar solution were employed. No untoward effects, erysipelas, or other infection, were observed in 800 cases thus treated.—*Deutsche Zahnaerztliche Wochenschrift.*

Suppuration of the Maxillary Antrum.—Antral suppuration of dental origin is comparatively rare, and much less frequent than that of nasal origin. Any of the upper teeth posterior to the canine may cause suppuration. The upper third molar is the most common source, the first bicuspid the rarest: it never arises from the canine. The infection is chronic, not by any means acute. Dental antral suppuration should be treated by extraction of the offending tooth, and syringing the antrum from the nose. Alveolar puncture fails to cure antral suppuration, and should be discarded as highly unsatisfactory. Antral suppuration of long standing should be treated by permanent drainage into the nose. —E. D. D. Davis, *British Dental Journal.*

Manipulation of Amalgam.—If the packing of amalgam is done with all of the force of the pen-grasp and while the amalgam mass is in a condition bordering on sloppiness, it will be found that as soon as sufficient compression is made to pack, the excess mercury is expressed to the surface and may be scraped off with the side of the plugger. The remaining filling will be harder and more solid than when packed by removing the excess mercury during the kneading; the amalgam will set as quickly, and the weight of mercury removed during this procedure will average quite as much if not more than when completely removed during the kneading, as generally practiced.—W. E. Harper, *Dental Review.*

Frequency of the Occurrence of Endamœba Buccalis.—Anna Williams, of the Park Laboratory of the New York Board of Health, has just been conducting a series of tests in which amœbæ have been found in—Normal children's mouths, 50 per cent. Slightly diseased adult mouths, 80 per cent. Mouths with pus pockets, 90 per cent. It is noteworthy that a large proportion of the children were infants. Amœbæ are so widely distributed in nature that no surprise need result. As we are not wont to expect Riggs' disease in the mouths of children, these investigations rather point to the increased presence of amœbæ in more luscious pasture grounds, as a result of favorable conditions for their nourishment, but not as a cause of disease.—J. J. Sarrazin, *Items of Interest.*

Precautions Necessary for Handling Tubercular Patients.—We have evidence to show that the majority of people in cities are frequently exposed to infection by the tubercle bacillus, but even under existing conditions of careless handling of the human machine and disregard of physiological laws, most of us still possess the power of preventing serious infection by this germ. To sum up briefly, it is necessary that the dentist observe a few precautions which will prevent his being the means in his daily practice of transmitting the germs of tubercle bacillus from one individual to another, including himself, and that he must also both practice and preach the application of natural physiological laws, which will do much toward preventing infection when actual exposure cannot be avoided.—C. A. Smith, *Dental Summary.*

Prevention of Mercurial Stomatitis.—Mercurial stomatitis develops only when the blood contains mercury in a form that combines with albumin on and around the teeth to form an irritating compound. Prevention must be directed to keeping the cracks and crevices of the mouth clean of albumin. The tooth-powders used must be of absolutely soluble material, so that nothing be left to get into crevices, and all tartar must be carefully removed. Treatment should aim to sterilize all the crevices—the writer using a syringe with a long, fine tip to force the disinfectant into the crevices. He has found hydrogen dioxid especially effectual when used freely in this way. If this is done now and then during the course of mercurial treatment, even the predisposed may be saved from stomatitis.—J. Almkvist, *Hygiea*, Stockholm, per *Journ. of Amer. Med. Association.*

Wood Points as an Adjuvant in the Cleansing of Teeth.—Neither silk floss nor the tooth-brush will cleanse the middle of the buccal and lingual cervix of teeth in many cases, and to overcome this defect small wood points held in a tubular holder with one straight and one curved end, are advocated. The manner in which this is employed is important. In all cases the carrier should be held in the hand as though using a pen after the manner of the Spencerian system of penmanship. The third and little finger are used as a fulcrum and rest upon the chin or teeth. The wood point is placed upon the distal cervix of the third molar, just touching both the tooth and the gum. By rocking the hand slightly the wood point is carefully drawn along the cervix until it rests in the first interspace, all jumping across the space being avoided. The position of the fulcrum fingers is then changed slightly, and the next tooth is cleansed. The rule is to have the patient "keep" on the tooth but "feel" the gum as the work is done. All rubbing back and forth is to be avoided, as this may injure the gum. The angle of the carrier permits this work to be done in all situations; once a week is enough.—O. E. Inglis, *Garretsonian.*

Ulcerative Gingivitis at the Front.—Zahnarzt Lange has frequently had occasion to treat at the front a form of gingivitis which may be classed among the "trench diseases." The patient first feels severe burning of the gingivæ, the pain assuming such intensity that mastication is almost impossible. There is diffuse swelling extending from the gingival margin to about half the distance to the root-apex, of bluish-red color, and very sensitive to pressure, with pus exuding from pockets. The inflamed gingiva contains small foci of pus, which after evacuation by incision heal quickly. As the gums bleed readily, blood coagula mixed with pus are frequently found between the teeth. The gingival margins finally undergo putrid degeneration. Fetor from the mouth is present. The disease is usually limited to the anterior teeth, which remain firm, however. The therapeutic treatment consists, in the early stages, in massage and rinsing with hydrogen dioxid and tincture of myrrh. The pus foci are incised. In cases of degeneration of the gingival margins, the destroyed portions are removed, and small iodoform-gauze tampons are inserted between the teeth. After adjuvant treatment with tincture of iodin, and rinsings with H_2O_2 and tincture of myrrh, a cure is effected in one or two weeks.—*Deutsche Zahnaerztliche Wochenschrift*, per *Deutsche Monatsschrift für Zahnheilkunde.*

Treatment of Rhachitis.—The first step after a diagnosis of rhachitis has been made is to remove the child to healthy surroundings. Thus, for example, it is useless for one to commence the treatment of this disease if the child is housed in a poorly ventilated and lighted room in which several other children are housed at the same time. The child should have daily tub baths, and after the bath it should be vigorously rubbed with a rough towel; a handful of sea-salt should be placed in a tub of water. A change of air from the city to the country is also excellent in many cases.

If the child is over three years of age at the time the disease develops, the nose and throat should be thoroughly examined, and if the tonsils are enlarged, they should be removed. If there is any pain in the nose it should be remedied. No doubt correct breathing has much to do with this disease, and the author believes that one of the important factors capable of causing the disease is carbon-dioxid poisoning. One should therefore make the exchange of the gases of the lungs as free as possible, and thus eliminate as much as possible this likelihood of carbon-dioxid poisoning. The intake of air is far more readily performed than is its expulsion. It is therefore imperative that the nose and throat should be cleared of all obstructions. This is especially the case with the nose, for it is anatomically built so that it warms and filters the air before it reaches the trachea, bronchi, and lungs.—F. Hecker, *Internat. Journ. of Orthodontia.*

Working Retainer.—Primarily this appliance is not intended for extensive movement of the teeth. It is most efficient when used as a working retainer. Gold alloy material should be used throughout to obtain the best results. The lateral incisors are banded with gold alloy band material, and Angle's arch pin-tubes are soldered on the labial surface of each lateral incisor band, parallel with the long axis of the tooth. For the short arch, extending from lateral incisor to lateral incisor, .03-gage gold platinum wire is used. The greatest of care should be exercised in adapting the arch to the labial surface of the lateral incisors. When rotation is desired, Angle's arch pins should be soldered to the short arch and pushed into place upon the teeth, before adapting the wire, which extends over the incisal edges of the central incisors. Great care should be exercised in the adaptation of this wire to the labial and lingual surfaces of the central incisors, and also to the position it should occupy when soldered to the short arch. The wire on the lingual surface of the teeth should be tapered sufficiently so that it will not interfere with the occlusion of the teeth.

By using this appliance intelligently, one should be able to secure rotation of the lateral incisors, elongation of the central incisors, and root movement in any direction desired. The appliance can be easily removed, adjusted, and replaced.—G. B. Steadman, *Internat. Journ. of Orthodontia.*

Malignant Tumors of the Jaws.—Turck believes with many others that cancer can be cured only by thorough operative removal in the early stages, and that cure is never certain unless the cause is removed before cancer begins. He believes that when cancer of the deep tissues has progressed to a point where a positive clinical diagnosis is possible, cure by any means whatever is improbable if not impossible.

In the vast majority of cases, the small growths, irritations, or tissue changes about the jaws from which cancer develops may be removed without danger under local anesthesia, with one hundred per cent. of cures. Cancer may be classed as a preventable disease; it always gives some warning of its approach; there is always first some small benign sore, ulcer, or growth; cure is always possible if the disease is arrested in its incipience. Procrastination has killed more patients than the surgeon's knife.

Turck states that differential clinical diagnosis between early malignant epulis and benign fibroma of the gum is usually impossible; the growth should be removed, subjected to immediate microscopic examination, and, if found malignant, radical resection should be done at once.—*Journ. Florida Med. Association*, per *Surgery, Gynecology, and Obstetrics.*

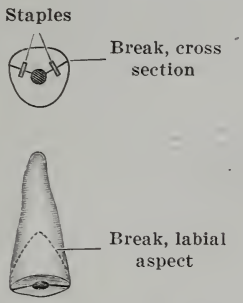
Preservation of Deciduous Molars.—The deciduous molars are the teeth that will need the most attention. It is a lamentable fact that but few of these teeth are in a sound condition when shed. The teeth should be watched carefully, and cavities filled while small. I use copper cement very extensively in this class of cavities, and have very satisfactory results; I sometimes use amalgam, but, as a rule, prefer the cement because of its medicinal properties. But often the child is not brought to us until these teeth are aching. When the carious portion is removed the pulp is exposed, or, still worse, is found to be dead. In cases of exposure, I dress with carbolized resin, and when the child returns, two days later, if there has been no pain I proceed to fill the tooth. I use cotton rolls to keep the cavity dry while removing the dressing and capping the pulp. For this capping I use thymolized calcium phosphate mixed with oil of cloves. The cavity is then filled with copper cement, or amalgam. Another method which has given very good results in cases of this kind is the use of carbolized resin for capping. When the pulp is capped, if there is any soreness following the filling, it indicates that the pulp is dead; in that case the filling should be removed and the tooth treated. For this work I use silver nitrate. Dressing the tooth with it, I allow this dressing to remain two days; it is then removed and renewed. Two days later the tooth is filled, using silver nitrate in the bottom of the cavity. No effort is made to fill the canals. This method has given splendid results for the past five years. The parent should be told to watch the tooth, and if at the time when it should be shed it does not loosen, to have it extracted. This will usually be necessary, as the roots of these teeth when pulpless are rarely absorbed.

If the pulp is putrescent, cresol or formocresol is used to correct this condition. If the roots have not been absorbed, I use formocresol. Only a small quantity of this preparation should be used, as large quantities are likely to cause soreness. When the roots are absorbed, I prefer cresol. When the canals are thoroughly cleansed, silver nitrate is used and the tooth filled as described.—J. B. Lester, *Dental Summary.*

Hints, Queries, and Comments.

METHOD OF REPAIRING A SPLIT ROOT.

The following method was successfully employed for saving a split root. The history



of this case was as follows: Mr. M. presented with an upper left central incisor which had been carrying a Logan crown for about ten years. Through a sudden and undue strain, the root had split on the labial surface to about one-third of its length. As the lingual portion was solid, and there was not sufficient space under the gum margin to allow the fitting of a band, a small gold wire was first placed around the neck of the root to hold it together, and two small holes were bored in each section on both sides of the break to the depth of about one-eighth inch, and two gold staples were made and cemented to place. Within about ten days, all soreness had disappeared; subsequently, the crown was reset, and has been giving perfect satisfaction since.

J. T. Ashton, D.D.S.

Alexandria, Va.

Obituary.

DR. SAMUEL A. BEECHER.

Died, at St. Paul, Minn., September 18, 1915, Samuel A. Beecher, D.D.S.

Dr. Beecher was born in Washington, Mo., in 1843, and received his degree from the Pennsylvania College of Dental Surgery, February 25, 1865, with twenty-eight colleagues, constituting a class many of whose members later rose to eminence. Among these were Benj. J. Bing, now of Paris, Edwin T. Darby, S. H. Guilford, and J. A. Woodward of Philadelphia, John Nutting Farrar and Safford G. Perry of New York, and W. H. Scholl of Reading.

Dr. Beecher after his graduation entered upon the practice of his profession in St. Paul, where he continued in active practice until his retirement about six years ago.

"IN MEMORIAM" RESOLUTIONS.

Dr. G. V. Black.

The members of the Minnesota State Dental Association wish publicly to express their sorrow at the death of their friend and associate, Greene Vardiman Black, and to that end have passed the following resolutions:

Resolved, That the loss of a teacher so zealous in the cause of science, so warmly human in his devotion to the best interests of his students and his fellows, so distinguished in his far-reaching influence upon the standards and ideals of scientific education, is irreparable to the profession of dentistry; and be it

Resolved, That the warmest sympathy be extended to his family in their great bereavement; and be it further

Resolved, That a copy of these resolutions be spread upon the minutes of the Minnesota State Dental Association, a copy sent to the family of the deceased, and a copy be sent to the various dental journals.

Glen F. Andrews, *Chairman*,
Robert Wilson,
Alfred Owre.
Committee.

The following memorial resolutions were adopted by the St. Louis Dental Society:

In compliance with the law of the universe, which limits man's stay upon earth, Dr. Greene Vardiman Black was called to the great Beyond on Tuesday, August 31, 1915, at Walnut Lodge, Jacksonville, Ill., the home of his childhood.

The Fates whose office is to spin the thread of human destiny were wise in extending his career beyond the allotted threescore years and ten, that we might benefit to the utmost by the bountiful fruits of his indefatigable labors.

In the passing of this superior intellect, dentistry lost the greatest single benefactor in the history of the profession. Dr. Black was highly honored for his brilliant achievements in science, tendered to his contemporaries generously and without thought of material reward. He was sincerely loved for his kindly helpfulness, granted indiscriminately to all who approached him.

His early influence in our city began with his affiliation with the Missouri State Dental Association at its inception in 1866, and continued with the Missouri Dental College, where he received the honorary degree of D.D.S. in 1877. Here he taught histology, pathology and operative dentistry from 1870 to 1880. Thus we of St. Louis have long claimed him as one of us, and have special cause to mourn the dimming of this beacon light; therefore be it

Resolved, That we, the members of the St. Louis Dental Society, in meeting assembled, with a full realization of the magnitude of our loss, give heartfelt expression to our grief and tender our profound sympathy to the bereaved family; and be it further

Resolved, That a copy of these resolutions be spread upon the minutes of the society and a copy sent to the family and to the professional journals for publication.

H. F. D'Oench,
J. F. Austin,
J. D. White,
Committee.

Society Notes and Announcements.

NOTICES should reach the Office of the DENTAL COSMOS not later than the 10th or 11th of the month preceding that of publication.

NATIONAL MOUTH HYGIENE ASSOCIATION

Department of Extension Lectures.

The lecture rental service inaugurated by this department in May 1914 has placed our first lecture, designated as Lecture "A," "The Care and Use of the Human Mouth," before about half a million people, easily establishing itself as an educational factor of no small importance in connection with the present Mouth Hygiene campaign.

As less than fifty per cent. of the expense of maintaining the service to date has been met by rental fees and receipts from the sale of outfits, and there seems to be no reason why the department should not be self-supporting, both rental and sale rates will be advanced November 1st as follows: Rental charge for use of manuscript and 36 slides, one date, $2.50 (former rate $1); additional charge for day following, $1 (former rate .50); retention for third and each subsequent day, .50 (former rate .25). Purchase price advanced from $19.85 to $25, giving purchaser full rights for personal use; giving societies rights for use by their members only.

This advance in rates will enable the department to extend the work in many needed directions, and make possible the preparation of other lectures which seem to be needed for special types of audiences.

Application blanks will be furnished by the undersigned, to whom all communications relative to the service should be addressed.

Edwin N. Kent, D.M.D.,
330 Dartmouth st., Boston, Mass.

OHIO STATE DENTAL SOCIETY.

Semi-centennial Meeting and Dedication of the Miller Memorial,

AT COLUMBUS, DECEMBER 7, 8, 9, AND 10, 1915.

Partial Program.

Historical Address by the President, Dr. E. C. Mills.

Dr. Hermann Prinz, "On Causes Concerning Susceptibility and Immunity to Dental Caries."

Dr. Geo. H. Wilson, "Some Problems in Mounting Full Artificial Dentures."

Dr. Chas. C. Voelker, "The Place of Silicate Cements in Dentistry."

Dr. Geo. E. Johnson, "How to Read X-Ray Films."

Dr. J. H. J. Upham, "Pyorrhea Alveolaris from a Medical Viewpoint."

Fifteen-minute practical papers:

Dr. W. O. Hulick, "Are Crowns and Bridges a Menace to Health?"

Dr. J. P. Henahan, "Conductive Anesthesia in the General Practice of Dentistry."

Dr. C. K. Teter, "Management of Difficult Extractions."

Dr. H. V. Cottrell, "Accessories to Articulation."

Dr. Gillette Hayden, "Differentiation Between Average Tooth-cleaning and Prophylaxis."

Dr. L. E. Custer. (Subject to be announced.)

Explanation of the Harrison Narcotic Law by the Deputy Collector of Interval Revenue.

Dr. E. C. Kirk will deliver the principal address at the Dedication of the Miller Memorial Statue on Wednesday afternoon, followed by Drs. T. P. Hinman, T. W. Brophy, N. S. Hoff, and others.

Thursday morning will be devoted to the presentation of a number of illustrated descriptive clinics before the entire society, and Friday morning to a large number of general chair and table clinics.

On Wednesday evening a banquet will be served for our guests and members.

It is the expectation that this meeting will set a new high mark in our State Society gatherings. Dr. Hinman, president, and Dr. King, general secretary, of the National Dental Association will be present, and members of all other state societies will be given a cordial welcome.

In view of the features of especial interest we hope to have representatives from every state, inasmuch as nearly every state contributed to the Miller Memorial.

Please note the four days' session, and be assured of a hearty welcome and a good time.

F. R. CHAPMAN, *Sec'y*,
305 Schultz Bldg., Columbus, Ohio.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE National Association of Dental Faculties will meet at the Hotel Radisson, Minneapolis, Minn., Friday and Saturday, January 28 and 29, 1916.

C. C. ALLEN, *Sec'y*.
N. W. cor. 10th and Troost, Kansas City, Mo.

AMERICAN INSTITUTE OF DENTAL TEACHERS.

THE annual meeting of the American Institute of Dental Teachers will be held at Hotel Radisson, Minneapolis, Minn., January 25, 26, and 27, 1916.

There will be a number of interesting papers, reports, and discussions by prominent dental educators. All dental teachers are cordially invited.

J. F. BIDDLE, *Sec'y*,
517 Arch st., N. S. Pittsburgh, Pa.

TEXAS STATE DENTAL COLLEGE.

ADVISORY BOARD NAMED BY DALLAS COUNTY DENTAL SOCIETY.

AT a recent meeting of the Dallas Co. (Texas) Dental Society, attended by members of the faculty of the State Dental College, a proposition whereby the management and direction of the college is placed in the hands of an advisory board composed of Dallas members of the county society was adopted. This board was named as follows: Bush Jones, J. W. Halsell, A. L. Frew, S. L. Barron, J. R. Beachum, G. Waller Staples, J. J. Simmons, and C. L. Morey.

After the meeting of the county society the Advisory Board went into session and elected the following officers: J. J. Simmons, president; Bush Jones, vice-president; C. L. Morey, secretary; J. W. Halsell and A. L. Frew, new members of board of directors.

The proposition to the above effect was

made by members of the faculty of the State Dental College to a committee of the county society, and was generally discussed, meeting with unanimous indorsement. The board will take charge of the management of the college at once.

C. L. Morey,
Sec'y State Dental College.

MARQUETTE DENTAL ALUMNI ASSOCIATION.

The tenth annual clinic, manufacturers' and dealers' exhibit of the Marquette University Dental Alumni Association will be held at the Auditorium, Milwaukee, February 16, 17, and 18, 1916.

The officers and committees are planning a program for this meeting which they feel sure will be of interest to every dental practitioner. Try and arrange to be with us at this meeting.

V. A. Smith, *Sec'y.*

IOWA BOARD OF EXAMINERS.

The next meeting of the Iowa State Board of Dental Examiners will be held at Iowa City, Iowa, commencing Monday at 9 A.M., December 6, 1915.

For full information and application blanks apply to

J. A. West, *Sec'y,*
417* Utica Bldg., Des Moines, Iowa.

CALIFORNIA BOARD OF EXAMINERS.

The next examination of applicants for a license to practice dentistry in the State of California will be held in the city of San Francisco, beginning on December 9, 1915. All applications must be accompanied by (1) the fee of $25.00; (2) necessary credentials—diploma and license from other states; (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

Testimonials of good moral character for applicants who are licensed in some other state of the United States must bear the signature and seal of the secretary of the Board of Dental Examiners or the secretary of the State Dental Association of that state. For further particulars address

C. A. Herrick, *Sec'y,*
133 Geary st., San Francisco, Cal.

TEXAS BOARD OF EXAMINERS.

The next regular meeting of the Texas State Board of Dental Examiners will be held at the Adolphus Hotel, Dallas, Texas, beginning Monday, December 13, 1915, at 9 A.M.

All applications, accompanied by the fee of $25, should be in the hands of the secretary not later than December 8th. Official application blanks will be sent upon request. For further information address

C. M. McCauley, *Sec'y,*
840 Wilson Bldg., Dallas, Texas.

NEW JERSEY BOARD OF REGISTRATION.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their semi-annual meeting and examination in the Assembly chamber at the Statehouse, Trenton, N. J., December 6, 7, 8, and 9, 1915. License fee $25. Re-examination fee $10.

The following practical tests will be required: Insertion of an approximal gold filling, compound approximal amalgam filling, and a silicate filling, besides a practical test of the applicant's ability in oral prophylaxis; also preparation of a cavity for an inlay with wax pattern. Prosthetic dentistry: Five-piece bridge and Richmond crown in addition to an anatomical articulation of a full upper and lower set of teeth. Teeth to be furnished by applicant. Wax bites properly trimmed and in place on models for inspection before setting up teeth.

Attention is directed to the following requirement: "All applicants for a license to practice dentistry in New Jersey shall present to said board a certificate from the superintendent of public instruction showing that before entering a dental college he or she had obtained an academic education, consisting of a four years' course of study in an approved public or private high school, or the equivalent thereof." In accordance with the law, the secretary will issue application blanks only upon presentation of the required certificate from the superintendent of public instruction, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to the acting secretary,

John C. Forsyth,
430 East State st., Trenton, N. J.

WISCONSIN BOARD OF EXAMINERS.

THE semi-annual examination of the Wisconsin State Board of Dental Examiners will be held at Marquette University, Milwaukee, Wis., beginning 9 A.M. Friday morning, December 17, 1915. All applications must be in hands of the secretary by December 7th. For further particulars write

F. A. TATE, *Sec'y*,
Rice Lake, Wis.

NEVADA BOARD OF EXAMINERS.

THE Nevada Board of Dental Examiners will hold its next semi-annual meeting in Reno, Nev., commencing December 17, 1915, to examine applicants, and to attend to such other business as may properly come before the meeting.

All applicants must communicate with the president or secretary of the board ten days previous to the meeting of the board, inclosing the fee, $25. Nevada has interchange with no other state regarding license, and its dental law is practically the same as the California dental law.

Direct all communications to both the president and secretary.

DAVID W. RULISON, *President*,
218 N. Virginia st., Reno, Nev.,
W. H. CAVELL, *Sec'y*,
Carson City, Nev.

PENNSYLVANIA BOARD OF EXAMINERS.

THE next regular meeting of the Pennsylvania Board of Dental Examiners, for the examination of applicants who desire to register in this state, will be held in Musical Fund Hall, Philadelphia, and the University of Pittsburgh, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, December 15, 16, 17, and 18, 1915. Application blanks can be secured from the Department of Public Instruction, Harrisburg.

The board desires to call attention to the resolution adopted recently by the Dental Council requiring that matriculates in a dental college in 1915 shall have the equivalent of a four years' high-school diploma at the time of their matriculation, in order to be eligible for examination by the Pennsylvania Board.

The amendments to the dental law passed by the last session of the Pennsylvania Legislature make it necessary for every dentist engaged in the practice of dentistry in this state to register with the secretary of the Board of Dental Examiners before January 1, 1916, and annually thereafter, at one dollar per year. Blanks are being prepared and will be sent out as soon as possible. Anyone not receiving the blanks can secure them from

ALEXANDER H. REYNOLDS, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

DISTRICT OF COLUMBIA BOARD OF EXAMINERS.

THE next examination of applicants for license to practice in the District of Columbia will be held at the George Washington University, January 3, 4, 5, and 6, 1916. Applications should be in the hands of the secretary two weeks before the date of examination. Fee $10.

STARR PARSONS, *Sec'y*,
1309 L st., N. W., Washington, D. C.

PANAMA-PACIFIC DENTAL CONGRESS.

COPIES OF TRANSACTIONS.

THE Pacific Dental Congress Commission of 1915, now in charge of all matters relating to the congress and the publication of its transactions, desires to announce that a copy of the complete Transactions, when published, and a copy of the official Souvenir Program, will be sent to anyone making application therefor to the undersigned, and forwarding the fee of ten dollars.

Those subscribing for these extra copies cannot be regarded as being members of the congress—not having applied for membership before the meeting nor having been in attendance at the same; but we believe its transactions to be a very valuable addition to the history of dentistry, and the souvenir program, containing as it does many items of historical interest and value, will be acceptable to any member of the profession.

ARTHUR M. FLOOD, *Sec'y*,
240 Stockton st., San Francisco, Cal.

MONTANA BOARD OF EXAMINERS.

THE Montana State Board of Dental Examiners will hold a session for examination on January 10, 11, 12, and 13, 1916.

G. A. CHEVIGNY, *Sec'y*,
Butte, Mont.

SOUTH DAKOTA BOARD OF EXAMINERS.

THE South Dakota State Board of Dental Examiners will hold its next meeting at Sioux Falls, S. D., January 11, 1916, at 9 A.M. sharp, continuing three days. All applications must be in the hands of the secretary by January 1st. Fee $25. Address

ARIS L. REVELL, *Sec'y*,
Lead, S. D.

NORTH CAROLINA BOARD OF EXAMINERS.

THE next meeting of the North Carolina State Board of Dental Examiners will be held at Salisbury, N. C., beginning promptly at 9 o'clock on Thursday, January 13, 1916. For further information and application blanks address

F. L. HUNT, *Sec'y*,
Asheville, N. C.

ARMY DENTAL SURGEONS.

MEMORANDA OF CHANGES.

For the week ending Saturday, October 16, 1915:

First Lieut. Charles DeW. Deyton is granted one month's leave of absence.

Acting Dental Surgeon Edwin M. Kennedy is relieved from his present duty, and will proceed without delay to his home, and upon arrival there will report by telegraph to the Surgeon-general of the army for annulment of contract.

Leave of absence for two months and eight days is granted Acting Dental Surgeon Edwin M. Kennedy, to take effect upon his arrival at his home.

Leave of absence for one month with permission to travel in Japan is granted First Lieut. Franklin F. Wing.

For the week ending Saturday, October 23d:

Acting Dental Surgeon L. C. Ogg reports on one month's leave of absence; address Mt. Vernon, Ohio.

First Lieut. Frank P. Stone is relieved from duty in the Philippine Department, January 3, 1916.

Acting Dental Surgeon James G. Morningstar is relieved from duty in the Philippine Department, February 2, 1916.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING OCTOBER 1915.

October 5.

No. 1,155,342, to WM. P. DE WITT. Mouthpiece for saliva-ejecting apparatus.

No. 1,155,541, to JAMES B. BARDIN. Adjustable operator's seat for dental chairs.

October 12.

No. 1,156,106, to RUSSEL S. SMART. Toothpaste dispensing device.

October 19.

No. 1,157,309, to GUSTAV HOLTZ. Artificial-tooth facing and backing therefor.

No. 1,157,351, to HENRY E. WEBER. Dental chair.

No. 1,157,534, to FRED E. HART. Artificial-tooth facing with backing adjustment.

No. 1,157,565, to JAMES ERLE MAYER. Combined dental prop and mirror.

October 26.

No. 1,157,681, to WM. C. DALBEY. Root-beveling device.

No. 1,157,759, to THEODORE T. CATER. Dental vulcanizer attachment.

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1915.

First pages of monthly issues:

CLASSIFIED ADVERTISEMENTS

Under this heading we will print announcements concerning sale and exchange of practices, situations and help wanted, etc.

One insertion of a classified advertisement (not exceeding 50 words) $2.00, payable in advance.

One insertion of a classified advertisement, over 50 words (not exceeding 75 words) $3.00, payable in advance. Forms close on the 10th of the month preceding date of issue.

For Sale. In a thriving town in New Jersey. Modern dental office, doing good business. In best location in the town. Rent reasonable. Good reason for wanting to sell. Great opportunity for the right man. Address "STAR," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

For Sale. Practice and up-to-date equipment and beautiful modern home. Climate unsurpassed. Grain, stock and fruit section. Practice averages over $3000 per year. Town of 4000. No competition. Address "W.," care Archer-Schanz Co., Portland, Ore.

For Sale. Greenfield Artificial Roots. One medium size saw, two artificial roots, two root facers, two drills and two gum cutters. All of the latest type and never been used. Address "E. C. S.," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

For Sale. Modern office fully equipped. Two chairs, fountain cuspidors, Rhein light. Also complete laboratory, including oak bench, Ritter Lathe, Elgin Casting Machine, instruments. etc. Established ten years in same section of Brooklyn. Doing about $4000 business. First offer $1200 takes it. Equipment alone worth the money. Address "H. B. S.," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

For Sale. A full line of dental instruments, also furniture of the late Dr. J. K. Brown. Address MRS. J. K. BROWN, 508 King st., Wilmington, Delaware.

Wanted. Thoroughly competent operator to take over well established family practice, New York Country Town, on partnership, percentage or purchase plan. References, particulars and photograph. Address "DENTIST," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

Wanted. By woman graduate in dentistry; good operator; experienced; a position with ethical practitioner in New York or Pennsylvania. Address "RELIABLE," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

Bargain. A good paying practice in substantial residential section of Philadelphia. Rent low. Equipment modern and almost new, worth alone $600. Practice must be sacrificed because of health of present owner. Investigation solicited. Address "A. C.," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

Boston Office. A medium size, thoroughly modern, northern light office on one of the best streets, can be had at a very moderate rental. Unexcelled service at all times as resident owner a physician. Address DR. DECKER, 238 Newburg st., Boston, Mass.

Course. Conductive and Infiltration Anesthesia. Names of those having taken the course and using the method, furnished upon application. For further information address, E. A. SCHRADER, Independence, Iowa.

Opportunity An old-established dentist, located on Fifth ave. near 42d st., New York, desires to sub-let part of his office to a responsible ethical dentist, or take an associate. Splendid opportunity for specialist. Address "C. W. S.," care The S. S. White Dental Mfg. Co., 5, 7, 9 Union Sq. West, New York, N. Y.

To Rent. Rooms suitable for dental practice, situated on centre square in thriving village surrounded by rich farming community, in chief agricultural county in the United States. Rooms have the coveted north light and running water, with all modern conveniences. Desirable board can be had across the street. Address "M. A. M.," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

Special Attention. If you have a practice for sale or seek a location for a dentist, physician, veterinarian or nurse, write to me. I also negotiate purchase and sale of drug stores and locate drug-store operatives in any capacity. Address all communications to F. V. KNIEST, R. P. "Bee" Bldg., Omaha, Nebr. Established 1904.

Wanted. A good all-around man for an advertising office. Registered in Connecticut. When writing, state experience. references, etc. Address "CONN." care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

Young Dentist prefers business to profession; 25 years old. practiced four years with good success—would like to receive proposition from Supply Company or Dental Manufacturer. Address "S. G.," care DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

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