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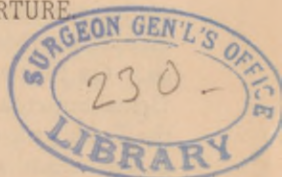
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New Principles in Dental Pathology.

A REVIEW OF THE SO-CALLED NEW DEPARTURE

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At a meeting of this Society held about a year ago, a paper having for its title "*Plastic Fillings, and the Basic Principles of the New Departure*," was read. That essay has attracted attention in some quarters, but much the greater portion of the profession have chosen to ignore it altogether. I cannot commend this course; for, if there be any new and great principle involved in this doctrine, the matter is worthy of our most careful consideration; and if it be a compound of errors, others have a right to an expression of our opinion to that effect.

He who discards old-established usage, and proposes a complete reversal of methods long in vogue—who places himself in direct opposition to well-established and accepted authorities—ought previously to carefully consider the ground he proposes to occupy, and be sure of his premises before stating conclusions. Luther, Kepler, Harvey, Newton, proposed, in their times, "new departures"; but they were themselves authorities in the positions they overthrew, and thoroughly conversant with and expert in such principles. It is a grave matter, this attacking a world. It may be an indication of the most determined courage, or it may be but an exhibition of the veriest foolhardiness. The assailant may be a true reformer, or he may be only a mistaken enthusiast. It is therefore our duty to critically examine new doctrines; to shun that undue credulity which disseminates error, as well as to avoid that pride of opinion which would close our minds to new ideas, simply because of their novelty. In this spirit let us examine the subject of the new doctrines.

I object to the proposed "New Departure," and cannot give it my support, because I believe it to be a mere vagary of the mind—a fallacy which does not even rise to the dignity of a sophism.

To establish my right to thus sit in judgment upon this proposed new

method of practice, I declare that I have studied the matter and patiently considered it; that I have instituted a system of experiments which I have observantly conducted during a period of more than four years; and that, the more closely I examine the matter, and the better I become acquainted with its basal principles, the more firmly is my faith in long-settled practice established.

To Dr. S. B. Palmer is due the full measure of credit for first presenting to the profession any theory concerning that which has since been modestly denominated the "New Departure." He is, you are aware, a *student*, according to the light given him. He is not a mere speculative theorist, searching for corroboration of a previously conceived hypothesis. On June 25th, 1874, Dr. Palmer read before the New York State Dental Society a paper entitled "Chemical and Galvanic Action upon the Teeth"; wherein was first (to my knowledge) broached the theory of galvano-electrical disintegration of the teeth. The paper was warmly received, and Dr. Palmer was urged to continue his investigations. At the meeting of the same Society, June, 1875, he read his paper entitled "Success or Failure in Dental Operations Chemically Considered;" and in July, 1876, another, called "Choice of Materials in Filling Teeth." These were his principal papers upon this subject. All were read before a Society in which I was vitally interested, and hence they especially challenged my attention. I immediately, after the hearing of his first paper, commenced a series of experiments to practically test the truth of his assertions, and have ever since been engaged in closely watching that which would be likely to prove instructive.

And now let me give my reasons for believing the "New Departure" a fallacy:

First.—It is, to my apprehension, an entire misconstruction of scientific law.

Briefly stated, the theory rests upon these hypotheses: That, in the presence of an acid, any two diverse substances form the elements of a battery; that one of these is at the positive pole, or assumes a positive relation to the other, and is therefore disintegrated; that different substances have widely differing electrical relations; and that upon these relations depends the amount of the disintegration, and which of the elements is acted upon and disintegrated.

Now, nothing can be stated against these hypotheses, *as such*. It is the interpretation given to them in which lies the mischief. The new-departures confound *cause* with *effect*. The tooth, the filling, and the oral fluids, form the elements of a battery. But the electric current is wholly dependent upon the chemical action of the fluids which generate it; instance the zinc and copper cell. In the presence of the acid the zinc is positive, and is corroded by—what? By the *electric current*? Not at all; but by the chemical action of the acid which *generates* the current.

Yet the new doctrines call upon us to believe that electricity, *per se*, is the destroying force.

It is an axiom among electricians, that there is no electric current without some preceding molecular change; that an electric current is but the effect of some producing cause. Yet here we see it elevated to a primal importance, and designated as the *cause of the cause*—a thing which has produced itself! To my apprehension, the galvano-electric current in the mouth is but the *effect* of tooth-decomposition through chemical changes in the mouth.

Second.—Any electric current which may be detected in the oral cavity is possibly due to other causes than the presence of the elements of a voltaic battery. There are constant thermal changes which are quite competent to deflect a delicate galvanometer. Before we alter our practice entirely, we desire to know that any possible current is traced to its proper cause.

Third.—An *electric* current may excite chemical action sufficient to decompose a compound, or even volatilize a simple substance; but a comparatively powerful current is required to do this. Most conductors are competent to carry away, without injury to themselves, all the electricity they are likely to receive. It is absurd to suppose it possible for any current to exist in the mouth, capable of decomposing tooth-tissue.

Fourth.—If a gold filling in a tooth is capable of developing a current sufficient to excite the disorganization of bone, what must be the effect of a partial gold plate in the mouth? It might readily be supposed (according to the new doctrines) to be as bad as a charge of dynamite.

Fifth.—If the presence of metals (which, according to this new gospel, assume a negative relation to the tooth) be the principal or only cause for decay of the teeth, then unfilled teeth ought never to decay, and there should be no necessity for filling teeth primarily, since one of the elements of the battery is then wanting, and, by consequence, there can then be no tooth-disintegration. But, since this is not, in reality, the case, why may we not say that the same conditions which produce decay before filling, do so afterward?

Sixth.—In the consideration of any of the phenomena of Nature, we never need search for a recondite cause so long as ample reasons lie near the surface, or in full view. A very sufficient excuse for the disintegration of teeth after filling may be found in imperfect manipulation, and direct chemical action, without appealing to electrolysis.

Seventh.—In any case, an electric current is but one of the factors in the sum of tooth-decay, whereas, by the terms of this new doctrine, it is elevated to the importance of being the only cause worth taking into account (see Articles II and III of the "New Departure").

Eighth.—I consider this new theory fraught with evil to the dental profession, because young dentists are, in effect, taught by it that the

years of patient, steady, persistent effort to reach a higher plane of excellence are thrown away, and that the unskilled recruit is fully the equal of the old veteran; that experience goes for nothing, and that firmly established principles may be swept away by a single blast from a discordant trumpet. If there be no necessity for thorough excavation, as has been urged by the apostles of this new-fangled theory—if a leaky filling is better than a tight one (see Article VI, New Departure)—and if the easily manipulated plastic fillings are superior to thoroughly impacted gold ones—then the time, practice and patient study necessary to learn the proper manipulation of gold foil are worse than thrown away, and those who have spent so many years in accumulating practical knowledge, are the inferiors of the boys just commencing their career. Then, at the outset of my practice, when my ability did not extend beyond the inserting of amalgam into improperly excavated, wet cavities, I was a better operator than I now am, after fifteen or twenty years of constant deterioration in the line of gold practice!

Ninth.—The return to plastic fillings is the adoption of a practice which has been proven to be inferior. American dentistry is known and honored among all civilized peoples, and American dentists are conceded to be without foreign peers. Yet European dentistry differs from ours only in the materials used, and the consequent manipulative ability. Gold has been the mainstay of the American dentist, and the possibilities of this material have stimulated him to the highest attainments in manipulative skill. The European dentist has used, mainly, plastic fillings, and his progression in dentistry has barely kept place with the possibilities of his material. The abandonment of gold means the forsaking of the metal which has made the American dentist what he is, and the adoption of that material which has made the European dentist his inferior.

Tenth.—The proposed "New Departure" in dentistry rests upon a hypothesis toward the proving of which not one element of satisfactory evidence has been advanced. When Darwin, Tyndall, or other scientists, propose any new doctrine, it is the result of a long and exhaustive series of experiments, either performed in the presence of unprejudiced spectators, or the most minute details of which are carefully set down. Upon what extended series of experiments does this new theory rest? Dr. Palmer, in his paper entitled, "Chemical and Galvanic Action upon the Teeth," gives a brief account of a very few. He says: "We take teeth and pound them in a clean wedgewood mortar, somewhat fine, and connect the pieces with the gold, using dilute sulphuric acid, and we find tooth-bone an electrolyte, or positive: the gold will remain a negative. Between the tooth and the gold the action of the needle will be slight; between tin and gold, very great. * * * The next test is between tooth-bone and tin foil." Now, it seems to me that such ex-

periments as these amount simply to nothing, in determining the points in question. In the first place, the conditions are not at all those found in the oral cavity. We do not question his very indefinite and inexact declaration, that "the greater the difference between two elements, the stronger the current;" but in what way does this prove that chemical disorganization of tooth-tissue is due to a galvanic current which this same chemical action develops? Tooth-bone, treated with sulphuric acid, may develop a current in the production of the resultant sulphate of lime; but we should not call this salt, so produced, the result of an electrical condition. If we are to abandon our present practice for a new theory, we desire to know exactly what experiments and proofs substantiate the hypothesis. We demand that trial tests be performed, either in our presence, or substantiated by such minuteness of detail as shall give others an opportunity to verify or disprove them. We want to know just what were the conditions of the tests. If it is stated that the galvanometer needle was deflected, we wish to know *what* galvanometer, and how it was used; for these instruments are not only very differently constructed and manipulated, but those of a kind vary greatly in results from each other. We ask what unit of resistance was used in the calculations; how the current was measured or shown; if measured, the number of ohms; if shown, whether it was by the galvanometer, the electrometer, by chemical action, by thermal effects, by induction, or "by guess." In short, we ask for *facts*, not speculations. Scientific men are not in the habit of accepting the crude ratiocinations of possibly interested men, in matters where carefully conducted experiments may practically solve the question.

If an active acid is used, letting go its hydrogen it unites with a base to form a salt, at the same time, and by this action, generating an electric condition. Hence, it is absurd to charge, *as the cause* of this action, one of its accompanying phenomena—the result of a chemical action which would generate a current without the presence of any metal. Again, if the elements be subjected to thermal changes, as in the oral cavity, a current may be developed without the aid even of an acid; for instance, warm a piece of platinum, place it in simple contact with gold, and a current is at once developed. Or, put a piece of zinc wire in proper contact with that of a Thompson galvanometer, then *twist* the wire, and your instrument will indicate the presence of an electric current. In fact, electrical conditions are produced by all molecular change, but such currents will not decompose tooth-tissue.

In view of these facts, I dispute the conclusions advanced by the new doctrine. I say that the so-called "New Departure" contravenes the fundamental principles of physics. It contradicts all science and all scientific men. It is utterly unworthy of even our respect, until it be established by experiments in the mouth, conclusive, and often repeated,

under all possible circumstances. Generalizations will not be sufficient, when it is sought by them to establish scientific truth.

But what are the conceded facts concerning this whole matter? In the February number of the DENTAL AND ORAL SCIENCE MAGAZINE, page 7, the propounder of this theory says:

"We have carefully, and, we believe, scientifically, investigated every line of experiment which has professed to show the current which, we believe, is eliminated by contact of metal with tooth-bone. This we have done with the best instruments and apparatus which our country can produce; and we find that such current *has never been shown, much less measured*. Even that curiously ingenious line of experimentation upon this subject, which was presented at the Centennial Meeting of the American Dental Association, and which gave to our profession that scale of relativity known as the 'Harvard Tension Series,' in which gutta-percha was placed at zero and gold at 200, and which gave those who had faith in gold such a 'black eye' (as it was expressed), we pronounce utterly worthless, and without any scientific basis." And again, the same author says: "Now you see, gentlemen, that, notwithstanding the fact that we are unable, as yet, to *demonstrate the existence of a current*, yet, nevertheless, the *reasonableness* and *consistency* of our theory is such, that we may say that gold, being a good conductor, and being itself unattacked, when placed in contact with tooth-bone must, on general principles, cause excessive electro-chemical action, which action must eventuate in the disintegration of tooth-structure—and *therefore* gold is the worst material to use, when a tooth is of such structure and in such condition as that it needs something which will help preserve it."

Here we have it! It is NOT *demonstrated*, but it is SUSPECTED! What reasoning is this to present to a body of scientific men who are searching for the truth?

And here I make my eleventh point against the "reasonableness" and "consistency" of this great discovery.

Eleventh.—The propounding of this "New Departure" presupposes a *theory*, which is the curse of study. Any one who is committed to such a thing, is honestly liable to the charge of laboring to establish a foregone conclusion—of working to prop an opinion formulated before all the evidence is in—of pronouncing the shield all one color before looking at both its sides. Study should be to reach truth, not to sustain an expressed opinion. True scientific men, searchers after truth, do not start out with a theory and then endeavor to find seeming facts to substantiate it. They first accumulate their proven points, and from them deduce laws. All the scientific world has learned to shun the man with a theory. It has passed into an axiom to "beware of hypotheses." According to the confession of one of the propounders of this new doctrine, the whole matter rests upon deductions elaborated from an uncer-

tain brain, rather than from an indisputable laboratory, and consequently is, until established by practical tests, unworthy our serious attention.

Heretofore I have been considering, more particularly, Dr. Palmer's electro-chemical theory. I now desire to say a few words concerning plastic fillings. On this point I find this modern "house that Jack built" divided against itself, and all the principles laid down for the guidance of its constructors, deliberately ignored or determinedly contradicted by their authors.

Dr. Palmer says that the multiplication of elements in a compound intensifies electrical conditions, and therein corroborates the voice of science; yet the "New Departure" urges the use of complex compounds in place of simple substances, for the avowed purpose of avoiding that which, in another place, it declares intensifies the disturbed condition. Is this a part of the "consistency" and "reasonableness" of the new theory? All hydro-carbon gums, as gutta-percha, readily undergo the molecular changes which generate electrical conditions. Gutta-percha will slowly disintegrate, even in air. You all know how the surfaces of such fillings decompose and become spongy in some mouths. Theoretically (and the disciples of the "New Departure" cannot object to this manner of viewing the subject), the more simple the substance, the less is it affected by chemical or galvanic influences. The union of gold and tin is much more liable to develop a current than either alone. According to all scientific testimony, compounds are liable to evolve complex electrical currents which simple substances avoid. Of all the metals, gold is the least oxidizable, and the most stable, and hence, from the stand-point of evidence adduced by the "New Departure" itself, it is the very *best* material with which to fill teeth.

On *prima facie* grounds (the favorite method of argument with the students of the "New Departure") compounds are, then, unfit to put in the mouth at all. None such are entirely stable, and the more complex their elements, the greater the probable electrical changes. German silver (nickel and copper) always tastes badly, because in the presence of the fluids of the mouth electrical changes are induced. The molecular changes attending the crystallization of amalgam, especially when accompanied by thermal disturbances, as in the mouth (it is *reasonable* and *consistent* to suppose), *must* develop a galvanic current; and accordingly there is almost universally a bad taste succeeding the introduction of amalgam fillings.

But on this subject I cannot do better than quote Dr. Palmer—he who has furnished, ready-made, the basal theory of the "New Departure" (for the author of the paper read before you a year ago announced himself as simply the mouth-piece of Dr. Palmer). In the paper wherein Dr. Palmer first made known the result of his studies (read before the New York State Dental Society in 1874, and already quoted

from), he says (Transactions of the New York State Dental Society for 1874, page 155):

"A porous tooth containing an amalgam plug has in it the elements of a minute, yet intense, battery, capable of decomposing not only the plug, but the tooth around it; this is in accordance with a law of chemical affinity. * * * * Chemical affinity cannot be cheated of its action, and the greater number of elements there are in a battery, the greater number of currents and counter-currents there will be; and galvanic action takes place on all surfaces of the mass, and within as far as moisture extends. We look in vain for amalgam plugs to be bright on the surfaces in contact with dentine. The action is between the compound and the mercury; while, in tin, only the outer surface is acted upon; that is, tin or gold represents one element each; and before any galvanic action can take place between such plugs and dentine into which they are inserted, there must be a space for a fluid to excite action.* With amalgam, the moisture in the tooth-bone is sufficient to communicate the current which exists in the plug to the tooth, and thus enlarge the cavity, or diminish the plug, or both.† * * * * The fact is, the addition of metals to a compound only complicates galvanic action."

Thus, then, we find that the author of the electro-chemical theory can be successfully quoted against himself; and he asserts that amalgam compounds only intensify that electrical condition which, we are told, is the main source of tooth-decay.

And now, in conclusion, I can only say that I have examined this matter as carefully as possible, and without any preconceived theories to establish. I have corresponded much with Dr. Palmer, and have endeavored to arrive at the *truth*. I desire to be courteous to those gentlemen with whom I am compelled to differ; but my courtesy does not go so far as to force me to accept their conclusions without a careful preliminary examination. For the results which they ascribe to galvanism, I am certain we need not go far to discover another cause, one much more in accordance with scientific law, and observed and recorded facts.

* That is to say, that any gold or tin plug which can excite electrical action prejudicial to a tooth, *must* have been *so badly inserted* as to allow space for penetration of moisture between it and the tooth; and hence, that a gold or tin plug, *properly inserted*, must be the *best* for the tooth, *since no galvanic action can occur between it and the dentine*.—W. C. B.

† Compare this statement with Article IX of the "New Departure", "Amalgam, *per se*, is an excellent filling material."—W. C. B.

