

## THE RELATION OF GENERAL BIOLOGY TO MEDICINE AND DENTISTRY FOR THE PEOPLE

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"It is characteristic of Science and Progress, that they continually open new fields to our vision." (Pasteur.)

Preventive Medicine, when viewed in its broad, general sense, indicates not only the prevention of disease and its consequences to the individual, but of still greater import to the mass of people. So does the Teaching Forces and Medical inspection of schools primarily concern themselves with the individual, thereby deserving a permanent place in the efforts being made to understand and eliminate disease and conserve health; and also in a far reaching way, it embraces the betterment of the masses both in its hygienic and economic aspects.

Organized beings are continually acted upon by their environment, and life is an expression of their continuous reaction. When reaction ceases, the organism becomes the passive prey to surrounding forces, life is extinct and has been succeeded by death. Living, the organism withstood the force of gravity and raised itself from the earth; maintained an equable temperature despite the surrounding alterations from heat and cold; retained the moisture of its tissues against the drying influence of the encircling air. In reacting against its environment, a living organism acquires its development, so that the endless struggle so bound up with life is not without advantages. So long as the organism is able to maintain the equilibrium of its functions, the condition is described as *health*. All creatures, however, are only capable of reacting against a special and very limited environment, hence a relatively narrow one. An Aviator succumbs to the rarefied air and cold before an altitude of 9,000 meters is reached, unless properly protected. Whilst the immense weight of water crushes in upon the Diver who dares brave the watery depths.

Civilization and disease go hand in hand, and the physician of today is to teach preventive medicine more than to treat

disease. The glutton, the inebriate, the profligate will persist despite the Reformer; the clash from mailed fists will go in defiance of the Humanitarian; and in the world of trade, where misdirected commercial zeal racks the nerves and oftentimes blasts the mind, the physician's warning will go unheeded. Indeed, so lightly do we regard our health that while our Departments of War, Navy, State and Agriculture are considered essential, the safeguarding of the people's Health finds no place in the Cabinet—the Cabinet that conducts the affairs of our Nation. Fortunately, there is some improvement along this line, and Teaching and Diplomas are now being given in Public Health.

Our Marine Hospital Corps has done some excellent work in Malaria, Pellagra, Hookworm and water-borne diseases, and we feel an incentive to carry on this work. Several reasons exist for the apathy shown. First and foremost, a careful guarding of the Medical Practice Acts which at the present time are most unjust to the practitioner by limiting practice according to Statehood. This country is called United, but the laws are far from being unified according to the legislature of the State. It reminds one of the old question, "When is a man a man? When he is asleep!" The existence of faddists may be a help but are oftentimes a danger unless they are endowed with a broadly educated brain and a high sense of justice and equality. And to no one is this truer than to you as Biologists, who realize into what problems you may be drawn.

How soon set theories are overthrown by a simple wild plant or animal appearing in an area it seldom or never occurred in before! The Mounds so often regarded as Man's work have been proved as natural remnants of waterborne glacial materials.\*

The question of pay to scientific workers in all countries has been a source of regret and only in Europe we have to look for government aid and appreciation of some student's discovery. Better give some encouragement now and not when a man has died! Problems of scientific education, the greatest discoveries and inventions have been made in the past by men with little

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\*Crook, Composition and Origin of Monks Mound. Trans. I. S. Academy of Sci., 1916.

formal scientific training, and in fields quite outside their ordinary vocations. Thus James Watt was a maker of mathematical instruments, Von Leeuwenhoek a Dutch spectacle maker; G. Stephenson, a colliery fireman; Arkwright, a barber; Edison, a railway porter; Cavendish, Boyle, Sir William Herschel and other great workers in the field of pure science might be described as gifted amateurs. No rigid distinction could be drawn between pure and applied science. Wireless telegraphy afforded a good instance of purely theoretical work leading to unforeseen but vast practical results. The telescope has revolutionized our conception of the universe; the microscope our conception of life. The significance and difficulties of correct microscopical observation must be believed to be very generally underestimated and that accurate observation is by far the most difficult art which mankind ever essayed.

The endowment of Institutes is a help but one, which if not carefully directed, becomes difficult to enter thru cliques, narrow portals or set opinions. Science knows no master, neither does she remain at rest. For cardinal principles of Living, we must know Biology (the science of life), together with the component sciences as given here, Palaeontology, Zoology, Morphology, Geology, etc., for otherwise the physician and dentist cannot grapple with the results of the deviations or deformities that come to his practice.

The scientific or professional branches require B. S. degrees rather than those of arts, for time and money spent is all too short for the foundations we *really need* in these rapid times. Formerly the classics held their sway, and it goes without saying, nothing should be excluded, for who does not need the languages for reading work, the chemistry rather than mathematics for basic reason, but the finality must be the test; and we find in this century, the Physician and Biologist are far more allied to each other and the Chemist and Physiologist with the Anatomist than the cultured classic or mathematician, or even the historian.

How is the relationship of Biology to Medicine and Dentistry borne out for the people? In so many ways, it is difficult to exclude them. First, a simple example may show a comparison

between the truth and a theory or a fad, Medicine in its broad sense and Eddyism.

Take one of the lowest and simplest forms of life found everywhere in some type or other in the water, in the slime, in the soil. The Amoeba—Geology claims it and even adds to it; the Zoologist follows with many forms and places; the Biologist regards it as a simple type; the Botanist sees food for thought in its flow of protoplasm and its relationship to that monstrosity but wonderful ne'er do well, what is it and where is it "The Myxias"; the Chemist analyzes its chemical composition and the physiologist regards it as a complex animal and wonders at its food supply and vacuole. The Histologist stains its Protoplasm, Spongioplasm and other structures and endeavors to spot the nucleus. The Pathologist with his confreres, the Physiologist and Histologist squabble over its amoeboid movement and phagocytosis. The one that it is a Leucocyte or white blood cell, the other that it has a vicious habit and gets into the wrong environment, the intestines, liver or mouth.

That it is a food source, the Bacteriologist not to be outdone, endeavors to horticultural it by adding soup, salts and drugs and claims it as a fine inducement to growth for plant culture in soils; and again has a puzzle to grow some other sorts; whilst the Physician or Internist is busy hunting in the excreta with the laboratory worker to end those intense pains, and the Dentist, not to be outdone, says to his colleague "That's the cause of loosening and falling out of teeth, Pyorrhoea." "No, it's not," said his friend, "it's an 'Eater of Bone,'" and so helps the oral surgeon to get a case, when up comes the preventive man and says, "You're wrong. It's doing its duty; it's mostly a good scavenger and saves the youngsters some work."

Gentlemen, my story includes the \*Amoeba Proteus, lobosa, radiosa villosa, verrucosa and Endamoeba Histolytica, Tetragonus, Buccalis and Endamoeba Coli of Panama and India, whether in the intestine, liver or mouth.

Amoeba of the mouth not a recent discovery as some writers describe, but the Entamoebae Buccalis Kartulis or Amoebae

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\*Endamoeba is parasitic for man, and the Amoeba a free living saprophyte.

Gingivallis of Gros 1849, and the Amoeboid action of the Leucocyte; each and all are known to you, each and all have taken years of study and lots of paper and printer's ink, each and all are nearly strangers even to you, eminent in your specialties, and we all need to follow Kipling when he said:

"It ain't the guns nor armament nor funds that they can pay  
But the close co-operation that makes them win the day.  
It ain't the individuals nor the army as a whole,  
But the everlasting team work of every bloomin' soul."

The Physician and the Dentist should have a better knowledge of Biology and must of necessity be a trained Microscopist. How much we need a better teaching in this subject, in all its departments, the use of illumination and the apparatus for the purpose, the smattering in most of our schools and colleges is deplorable. We need a course such as Professor Gage's at Cornell. Year by year the interest which is taken in the world around us, in the unspoiled works of Nature, continues to increase. It is now recognized that to train the powers of observation is one of the most important necessities in general education, and that it is far better for everyone to train himself naturally through the interest aroused by the subjects considered, than to learn nothing but second-hand facts from others. Whatever line of study is taken up, if any real progress is to be made, some aid to vision must be sought to see the structure and minute facts of the life of the subject. Here it is that the microscope comes into play, and it is not too much to claim that besides being the source of additional interest the instrument is a great educator, that is to say, it trains without appreciable effort the hand to be skillful, the eyes to appreciate, and the brain to elucidate. There will be times when the most enthusiastic Nature-student cannot be out of doors long dark winter evenings, wet days, even in summer, when indoor work must take the place of outdoor. It is then that work with the microscope will prove such a fascinating hobby and lead us into regions where it is impossible to travel without it. The whole science of bacteriology and the discoveries of the minute fungi which cause disease and putrefaction, which give the taste to butter and the flavor to cheese, entirely depend upon skilled

work and high powers of the microscope. It may be worth while to recall the address by Sir James Paget of England in 1880 on plant diseases and their relation to man; the oak-galls having been the favorite. The Crown-gall in both wild and cultivated plants is analagous to sarcoma in man. Dr. E. F. Smith has recently produced a complex tumor or embryoma. It may not be out of place to remind the members here that Prof. T. J. Burrill was, I believe, the *first instructor* in Bacteriology in the United States, for he gave Bacteria in his Fungi courses in the 70's and his paper on the Pear Blight in 1879.

The treatment of mouth and the gastro-intestinal tract is where we all work together, the internist, the chemist, the bacteriologist, zoologist, pathologist, and dietitian. Use here of Micro-analysis shortens time, is accurate, takes less material, fewer re-agents, and the results are the same. The sooner the Universities give a full medical standing in the 1st, 2nd, 3rd years for Dental students, or require the M. D. degree entire, the better it will be for all concerned; then specialize in the subjects desired as Occulist, Aurist, Dentist, etc.

To be able in this day and age to treat a case intelligently, medical and dental men must know germs, culturing, vaccines, serum-therapy, surgery, and even law in its medical and forensic aspects.

To the better understanding we need Biology in its broadest sense, the thorough mastery of the Microscope, its accessories, and we need to know and use the Polariscope and the selenites. Cheese yields various moulds and parasites. *Aspergillus glaucus* and *Penicillium glaucum*, cheese mites. Milk, water and all other foods and beverages require a good knowledge of biological studies even to the Textiles, for fibres yield errors and much amusement, as well as work to identify and trace in disease and for Medico-legal examination.

Flesh foods are important to all mankind in one way or another as Food and even Dangers in their uses.

The Zoologist is required as well as the Botanist, Biologist, the Veterinarian, the Chemist, the Doctor and the Dentist. Hence closer co-operation with one another is much to be de-

sired, for research, for disease and cure, and last but greatest of all for the welfare of the Country, the People and the Academy.

The Normal schools are amongst some of the largest factors in the educational scheme of this country and they must remember to include teachers who are trained in health work and a broad knowledge of dental study and the far reaching dangers of dirty mouths, which are so potent a factor in children. The time for dental examinations and treatment are unfortunately made too late; they need to begin at home and the kindergarten, when the teeth should be filled, the gums treated as well as the nose and throat; but today, I regard as one of the most vital helps for the race of mankind, the very early expansion of the jaws to make room for the development of the bones of the face and head, for about 60 percent. need it badly. It is easy to propound questions. It is often very hard to answer them. But when the answer involves the discovery of a principle, especially of a principle that can be utilized for the preservation of health, that answer is worth striving for.

Tropical Medicine has surely taught us to value all the group of sciences mentioned for the value of discovery has reclaimed barren tropical areas, drained Mangrove swamps, cultivated soils and marshes, saved thousands of lives from death by cholera, malaria, plague, leprosy, dengue, prevented smallpox, and for physicians no higher praise and tribute can be given than that paid Edward Jenner by Thomas Jefferson:

"You have erased from the calendar of afflictions, one of its greatest. Future nations will know by history alone that the loathsome smallpox has existed and by you has been extirpated." The discovery of wonderful seeds, plants and animals, and as for Economy and Colonization, the worth can never be estimated.

Compare, if you will, the weakness of the new religionist who without a proof can question so formidable an array of thinkers, from the days of the Palaeontologist to the Physiologist of today even to that startling phrase, the immortality of the Protozoa (Weismann).

Are we and have we not proved that Nature buries her secrets deeply, not lightly or weakly for human eye to see? To those who dig and delve, her whims, her schemes may some day be unbarred. To offer you to observe, reflect, compare, record, not one alone, but together prove that Nature is God's own Servant for the Truth.

Ten years after the Battle of Sedan, and thirty-three before the present war, the great French physician, Charcot, in his "Lectures on Senile Diseases", p. 20, (Trans. New Sydenham Soc. Lond. 1881. Trans. by Tuke) indulges in comment on French, German and English medicine that is perhaps more striking *now* than when first it was written. The pride of the Frenchman in Laennec and the Stethoscope is evident. Slow waking up of the German to modern scientific medicines and the influence of Schonlein, of Purpura fame, and of Rokitansky is charmingly described. For nobody should forget that Science owns no country and is the property of no race. His contrast of "the exclusive and illiberal ideas of the Prussian savant," (Virchow), with "the grand words of one of England's greatest physicians (Graves) is striking:

"The empire of reason, extending from the old to the new world, from Europe to the Antipodes, has encircled the earth; the sun never sets on her dominions—individuals must rest, but the collective intelligence of the species never sleeps."