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SOME DEFECTS IN ANATOMICAL TEACHING
IN THE MEDICAL SCHOOLS OF THE UNITED STATES.*

BY JOHN B. ROBERTS, A. M., M. D.

It has been truly said that anatomy and physiology are the foundation upon which the whole structure of medical education is built, and that consequently these sciences must be taught with exhaustive thoroughness and made the permanent intellectual property of the student.

The best medical schools in this country, with their four years' graded course requisite for the medical degree, have now attained an excellence probably not inferior to any similar educational institutions in the world. There still exist here, however, numerous useless and low grade medical schools, destined to be soon destroyed by the rapidly increasing number of State medical examining boards. In some of the former class of schools, and in nearly all of other grades, anatomical teaching has not reached the standard which the essential character of the subject demands. A consideration of the causes of this

* The opening address by the executive president of the Section in Anatomy of the First Pan-American Medical Congress, September 5, 1893.

defective instruction and a search for efficient remedies seem appropriate. It is my hope that you who are present will discuss the statements of this address freely and fully, so that each of us may thereby find suggestions of value in elevating and improving the work done in our own schools and States.

It is a notorious fact that few of our students have any knowledge of biology when they begin the study of human anatomy. I know of but three schools in the United States (Johns Hopkins University, University of Michigan, and Hahnemann Medical College of Philadelphia) where a preliminary examination in elementary biology is required. Although an entrance examination in physics is enforced by many medical schools, there are others which admit without any such requirement. In those which submit students to this preliminary test the examination is probably confined to very elementary questions. Several of our very best schools still allow young men to begin the medical curriculum without any previous study of Latin. It is a little embarrassing to know that students entering homœopathic colleges are required by the American Institute of Homœopathy to possess a broader general education than is demanded of our students by the American Medical Association, the Association of American Medical Colleges, or our best medical schools. The preliminary educational requirements of the Hahnemann Medical College of Philadelphia include botany, chemistry, biology, physics, and Latin. Certainly not more than one or two of our schools include all of these topics in the entrance examination.

It is not difficult to appreciate the confused ideas of human anatomy obtained by a first-year pupil who knows little physics, less biology, and no Latin. What wonder that he fails to remember the names of the bones and mus-

cles, and is filled with consternation when asked to mention an instance in the human body of a lever of the third class! He has no conception of the meaning of the descriptive Latin names of anatomical structures; wonders what is meant by "lever" and other mechanical terms; and is at a loss to know the significance of the terms "dorsal," "ventral," and "thoracic," and *iter e tertio ad quartum ventriculum*. Did not I, as a student, sit next a man who was unable to understand the function of certain laryngeal structures because the professor attributed to them a mysterious use called "phonation"?

Yet under our present system such students listen to lectures on osteology, syndesmology, and myology, and are expected to learn practical anatomy by dissecting the human body. To call such indecent butchery dissection is a farcical misnomer, as every demonstrator of anatomy knows. It would be much better to let these ill-trained hands learn the difference between muscle and fascia, nerve and vessel—which is about all such bungling teaches them—upon the dead bodies of the lower animals, and postpone dissection of human cadavers until the second or third year of the course.

Ebers has told in fiction of the Egyptian physician who, in the fourteenth century before Christ, ran the risk of condemnation by his heathen gods in order to obtain a human heart for studious dissection. You may remember his chagrin at finding his dearly bought prize so like that of the brutes he had often slaughtered in his quest for knowledge. Let the student of to-day begin his anatomical studies on the body of a dead cat, and he will learn much that will enable him to prosecute investigations in human anatomy with the ease of one to whom its fundamental principles are already known.

One of the most detrimental results of the acceptance

of medical students without preliminary education is that they have had no educational training in using their eyes and hands. An hour's stay in any dissecting room will prove this point. Here is a man holding his forceps as if it were a pair of fire tongs—there, another making a fruitless attempt to put an edge on his scalpel. Few students can describe what they see, and still fewer can make the crudest diagram of their findings. In scientifically conducted anatomical laboratories pupils should be required to describe orally or in writing what they uncover, and should make drawings of the more important features. This method is adopted in non-medical schools and in the study of histology and pathology in some medical institutions. It is undoubtedly the true method of educating the mind, which is not a receptacle to be simply filled with statements thrown into it from the lips of teachers. That which enters by the ears may lead to culture; but Nasmyth, the Scotch engineer, spoke truly when he wrote, "The eyes and the fingers—the bare fingers—are the two principal inlets to sound practical instruction." Who doubts that the anatomical discoveries of Ruysch in the early part of the eighteenth century were due to his possessing "the hands of a fairy and the eye of a lynx"? A recent writer on education avers that only in Germany and such countries as neglect to educate the young by means of manual training do we find men of learning who can scarcely sharpen a pencil without cutting their fingers. My experience in post-graduate teaching convinces me that for this reason operative surgery is impossible for some very intelligent physicians.

Manual training is valuable, moreover, because, as Felix Adler has said, hand culture brings brain culture. We need not only the worth and beauty of the object made, but also the psychological result brought by the effort for the utilitarian end. Physicians know that Seguin actually

created intelligence in the idiotic brain by manual training, and that mental discipline must not be too much subordinated to mechanical accuracy. The medical growth of not a few capable minds has been dwarfed by modern instruments of clinical precision. The time has certainly come when the medical schools of the United States should insist upon a preliminary examination in elementary biology. As soon as this requirement can be extended to include as certain amount of laboratory work in biology, students will have sufficient deftness and manual dexterity, added to their preliminary knowledge of natural history, to fit them for intelligently studying descriptive and practical human anatomy.

As you probably know, the British five-year medical course is reduced to four years in a medical school, if the registered student has previously been graduated in arts or sciences at a recognized university requiring a year in physics, chemistry, and biology. If no such general education has been obtained, these subjects are studied during the early part of the professional curriculum, which is then of necessity five years in length. In France the preliminary education of one who aspires to become *docteur en médecine* must show evidence of his having had instruction in natural history, as well as in all topics of general education. Germany and Italy also require a preliminary knowledge of natural history, as probably do all the European nations, except Belgium. In Brazil and, I think, in the other Latin American countries a biological requirement is a necessary part of the preliminary education of those who purpose beginning medical studies.

A young man desirous of entering a medical school had much better wait a year, and devote that time to biology, chemistry, physics, and Latin, than to attempt to begin professional study without an elementary acquaintance

with these subjects. The university extension courses will, in many sections of the country, give him the needed opportunity. If no such courses are accessible, a few books, even without a teacher, would answer the purpose.

If it is true that much unsuccessful anatomical teaching is due to the poor quality of the recipients, it is none the less demonstrable that a more extended influence for evil is exerted by the inferior mental qualifications of teachers and the unscientific methods of teaching permitted in some schools. This is, to a certain extent, the result of a custom that permits a professor, once appointed, to hold his position without forcible criticism until he dies or resigns, and prevents the faculty as a body influencing or regulating the manner or mode of instruction. The occupant of a professorial chair is practically an autocrat by courtesy.

Puschmann says that in the eighteenth century anatomical demonstrations on dissected bodies were frequent in many European universities, but that "in other places the neglect of anatomical demonstration was caused not so much by a scarcity of bodies as by the idleness and ignorance of the professors." Such a statement, it is to be feared, is not altogether inapplicable to the anatomical instruction now given in some quarters of the United States. Some men of great learning can not teach; the faculty of imparting knowledge is distinct from the faculty of acquiring knowledge. To teach is not simply to tell, but to make the fact stated so interesting and so clear that it assumes a living importance and is eagerly sought and intelligently retained by the hearer as a part of himself. A teacher must draw bold, clear outlines, omitting details and repeating essentials until his pupils have a mental framework upon which they themselves may erect more elaborate structures at a future time.

He who has not the power to select the essentials and lead the scholar to reason and observe is destitute of the teaching instinct. Then his lectures become mere recitations, as wearisome to himself as to his involuntary hearers. The true teacher furnishes his pupil with compass and chart; no more. The latter must select his route and reach his harbor by the exercise of those intellectual powers which have been given him. It is experience and not memory that has been called the mother of ideas.

Few teachers of to-day read their lectures on anatomy; but in some cases the lecture is still as lifeless as if read from manuscript or text-book, and destitute of either demonstration or true teaching. Didactic teaching can not be entirely relinquished, but it has little place in anatomy. Demonstration by specimen, dissected cadaver, blackboard diagram, and living model must be the chief reliance of the professor of anatomy who desires to hold the attention of his class and make anatomy what it is—one of the most interesting branches in the medical curriculum. Not many students will be absent from the lecture hour devoted to anatomy if they know that the statements read in their text-books are to be verified by electrical stimulation of the muscles on the nude model; that they are to see with their eyes and feel with their hands the difference between artery, vein, and nerve; that the teacher will create in colored crayon on the blackboard the diagram illustrating the relations of bone, muscle, and viscus; that the dissected cadaver will be studied in the standing posture; that the muscles of expression will be illustrated by photographs and etchings of public characters; that surface anatomy will become interesting because studied on reproductions of the famous works of ancient Greek art.

Muscular actions can only be taught effectively by vol-

untary use of the muscles of nude models, or by their involuntary contraction induced by the electrical current. Bones and other specimens in the hands of the instructors are of little value to the student seated twenty feet away. This distance effectually prohibits the latter from seeing the fissures, grooves, and foramina so learnedly mentioned by the teacher, who is perhaps simply reading for his own enlightenment the lettering printed on the bone. Even gigantic models in the hands of the teacher are less advantageous than duplicate specimens in the hands of the students during the time of instruction. Some teachers fail to appreciate that an elaborate picture, though valuable for reference by one who has known the anatomical region, is of little service to a student. The crudest diagram, made before the latter's eyes, conveys the idea and fixes it in his brain. A piece of chalk and a blackboard are imperatively demanded whenever and wherever anatomy is to be taught. Yet I recall the dissecting room of a well-known medical school which for years had no blackboard, no chalk, and no skeleton within its walls.

Occupants of chairs of anatomy not infrequently look upon their positions as temporary, and long for the occasion when they may be transferred to a department in which they feel more interest. Who does not know professors of anatomy that promptly became professors of surgery or obstetrics when the opportunity arose? One can as little expect such temporary anatomical chairs to be filled with enthusiastic and successful teachers as to find proper teaching of applied medical and surgical anatomy at the hands of physicians whose daily work is literature or life insurance. Again, it is not reasonable to expect those whose early education has been defective to be able to teach the mutual relations of anatomy to biology, mechanics, and psychology. The student needs a wide prelimi-

nary education in general knowledge; but the teacher of anatomy is helpless without it.

No criticism is too severe for the system that places first and second course medical students in one class room to hear the same didactic lectures on anatomy. Such a parody of instruction is probably unknown except in medical schools. To compel half of the class to hear what they can not possibly understand, to force the other half to listen to much that they have already learned, is recognized as idiocy by every one except the professional phonograph that each year repeats at a given hour the words which successive classes have received as teaching. Instruction that is not graded so as to lead step by step to higher knowledge is unworthy the name. It is impossible to compute the lost hours, undeveloped intellects, and disasters in medical practice due to this almost distinctively American folly. This undesirable method of teaching has been retained in the department of anatomy longer than in some other departments, because the important new facts to be taught in anatomy have been less numerous and conspicuous; therefore the whole subject can be pretty completely discussed in one session of lectures.

No method of instruction fulfills its mission if it does not develop the habit of independent investigation and work. Pupils need to be taught the manner of instituting and following out original inquiries and the use of the literature of a subject. Few colleges attempt to thus arouse the powers of observation and to sharpen the senses, for the prizes offered in some schools for a record of anomalies found in the dissecting room scarcely deserve consideration in this connection. Opportunities for original research in human anatomy are now given and such work is encouraged at the Harvard University Medical School, the College of Physicians and Surgeons of New York, and the

Medical Department of Clark University at Worcester, Massachusetts. The last institution, however, confers no degrees in medicine and does not partake of the character of a school for undergraduates. Didactic instruction at the hands of teachers who never contribute a single new fact or thought to anatomical or medical literature is not calculated to encourage a spirit of scientific inquiry in students. The demonstrated usefulness to the scientific world of a teacher's original labor is a powerful stimulant to investigation and scientific rivalry among his pupils. The need of such opportunity and example is much felt in our schools.

In certain things we need to return to methods employed in the middle ages, but later overlooked or forgotten. In the beginning of the fifteenth century naked men were used to demonstrate anatomical facts, and it is possible that outline diagrams of the deeper structure were made on the bare skin. Experience with students has abundantly shown me that such "anatomical clinics" meet with great favor. To group in one lecture several nude models representing the effects of disease on anatomical landmarks is most valuable and essential in teaching and sustaining interest in clinical anatomy. "Clinical conferences," in which before his fellows the advanced student points out and demonstrates anatomical relations upon the living subject, develop a habit of thorough investigation of medical and surgical cases. Its subsequent value in diagnosis is easily appreciated.

This form of anatomical teaching is manifestly impossible to an instructor who has no practical knowledge of diseased conditions. The necessity for comparative anatomy, morphology, embryology, and anthropology in a perfectly arranged anatomical curriculum may require a portion of the instruction to be given by a biologist pure and simple ;

so long, however, as a medical school is to train medical practitioners, the demand for a physician or surgeon to teach medical, surgical, and artistic anatomy will be imperative. The school that provides an enthusiastic biologist for the one purpose and a practicing doctor for the other will best fill the hours devoted to anatomy in the college course.

The lengthening of the medical curriculum in all schools to compel attendance on four college courses would give time for laboratory work in embryology and comparative anatomy. Graduation should then be deferred until the age of twenty-two years, as is now done in one school (the Woman's Medical College of Pennsylvania).

The museums found in medical colleges lose much of their teaching value because the students have limited access to the specimens. Bones and dissected preparations, both wet and dry, of normal anatomy should be put into the student's hands for comparison with his own dissections and the text-book illustrations. In most cases the teacher alone handles the museum specimens. Wet preparations demonstrating normal regional anatomy are almost unknown in our college collections.

The work done by students in the anatomical rooms would be of a much higher grade if each member of the class was required to draw, even in crude outlines, the structures uncovered by his dissections, and under the guidance of an instructor to demonstrate his findings to his fellows. The necessity of preserving cadavers in this country by vascular injection with zinc chloride and similar decolorizing agents militates to a certain degree against fine work in our dissecting rooms. The adoption of the principle of cold storage by some schools (Bellevue Hospital Medical College, Chicago Medical College, Medical Department of Western Reserve University, and perhaps others) shows a way out of this dilemma.

Examinations in anatomy, which might be public, should be conducted at various periods of the course. Those in the early part ought to be restricted to osteology and similar elementary topics; but the later and more difficult examinations in regional, surgical, and artistic anatomy should be so conducted as to require the use of the earlier knowledge, and include demonstrations of surface anatomy and of dissections. A substitution of English terms for the Latin nomenclature still largely retained in anatomy would aid the average medical pupil to understand anatomical mechanics and remember the facts which he has presented to him. Much was gained in European schools when the mediæval practice of teaching medicine in debased Latin was relinquished. The professor who had to use the vernacular was compelled to be accurate in statement and clear in expression, and could no longer hide his ignorance in high-sounding Latin sentences imperfectly understood by his class.

The true solution of the educational problem in medicine is the discontinuance of the isolation existing between medical schools and schools whose object is general education and culture. Every medical college should be an integral part of a college or university, and should not be managed by men separated from the wholesome educational atmosphere which surrounds institutions devoted to learning in its broadest sense. The perpetuation and organization of isolated medical schools has been the cause of manifold defects in medical teaching, and has ended in making medical pedagogics an undeveloped science. The educational and educative friendships, even the hostilities, engendered by a combination of medical and academical schools, would bring about better preliminary qualifications in medical students and more advanced methods of teaching in professors. It is the school and the man in the cor-

ner, who never comes in contact with his superiors, that fails to improve his methods of work. The valuable courses preparatory to medicine now found in several universities would then become more numerous; and more youths, looking forward to a medical career, would begin their studies in such courses if the university and the medical college were everywhere combined. Thus the study of medicine would be a gradual development of the mind, and not a mere attempt to crowd technical facts in the memory—a process in violation of the first principles of education and one which makes many medical journeymen, but few medical masters.

Universities, academies, and all literary schools would be benefited by the association with medical colleges, for it would lead to even greater modification of the formerly rigid classical course by the development of the departments of natural science and languages. This change would meet with the approval of many thinkers, among others the Emperor of Germany, who has in recent years shown the value of youthful energy by insisting upon the necessity of modifying the strict and unyielding classical curriculum so long enforced by the German universities.

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