

2. WAYS AND MEANS IN THE TEACHING OF GROSS ANATOMY

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There are certain objections to the course in gross anatomy made by the average medical student which must be taken into consideration in a discussion of the pedagogy of the subject. It is not my purpose to advise the adjustment of any course so that it will meet with the approval of the student, and in particular, with the medical student. It may be said that medical students have been so often exposed to or vaccinated by the various science courses in the required premedical curriculum that they appear to be relatively immune to the intrusion of new ideas, either as to subject matter or methods of presentation. This immunity to learning is rendered the more effective by the gratuitous advice of the successful practitioner, whose memory of the actual work of his student days is somewhat hazy, just as the quality of this said work has been somewhat enhanced in the telling, and by a halo of age. In defense, however, of our colleague, the practitioner, it must be noted that he uniformly advises the prospective medical student to 'know his anatomy.' I have made repeated efforts to run down exactly what this valuable suggestion may mean, but without success. The result is that the medical student comes to the dissecting-room with an interest which is not paralleled in any other subject of the elementary medical curriculum. In addition, the student has a certain amount of preparation in vertebrate anatomy—more or less misbegotten because he has regarded the study of vertebrate zoology as one of the necessary evils of the premedic years. There are three of these evils like the 'Three Musketeers of Dumas; physics, chemistry, language, and biology; named, as nearly as I can figure them, in unglibear order. It follows, therefore, that our novice in the course in gross anatomy

comes to us nowadays with the interest he possessed some twenty years ago, with certain more or less fundamental conceptions regarding vertebrate structure, and possibly with ideas concerning the phylogenetic relations of the more important organs. He naturally expects from a hurried dissection of the chief vertebrate forms that he is preparing to understand the relations in the human body the better. If his instructor does not materialize a comparative explanation or does not pitch the work on a plane which presupposes information the student has gleaned from actual contact with lower forms, the student is likely to ask himself an embarrassing question, "Why is vertebrate zoology a requirement for the study of gross anatomy?" He may also find a ready answer to the question by passing the word down the line "Get through somehow. You won't use it, anyway." If our premedical requirement is merely to furnish us with students two years older, and who have supplemented all of the bad habits of study in the high school with many of the vicious mental tricks of the college student, I, for one, would feel that the requirement has undergone a perversion in function.

All of us who have enjoyed a varied experience realize that all students may be divided into three classes: Those who are genuinely interested in the work and who take advantage of all of the opportunities because they really like the thing they do; those who are interested because the subject is made interesting to them, and, finally, the spoon-fed, led-by-the-hand variety who must have the subject 'learned' to them and whose main ambition in any subject is to outguess the instructor on examination questions and get by with it. The first-named variety comprises the very desirable class of students who learn in spite of their teachers; the second learn because of their teachers, and the third and unfortunately large per cent should contribute to a mortality list even more than they do. Yet even with them we must temper justice with mercy because they are a result of a mind-improving educational system which places a premium on learning the thing for the thing itself. Given a student whose mind has been so thoroughly cultivated that he cannot see the woods for the trees, and you have a desperate pedagogic problem. Add to this the lack

of initiative which usually accompanies this serious condition, and you have the pest who follows one about the laboratory absorbing ideas like a sponge sops up laboratory stains, and giving out these ideas under pressure with somewhat similarly mixed results.

It was my doubtful privilege, and one which I am sure the majority of you have not enjoyed, to put in my first course in anatomy under the old system. Gray's Anatomy was the family bible, and I gained a horror of systematic text-book recitation which has always stayed with me. The book was the thing and the body was merely an accessory after the fact, mutilated at night under the most sordid of conditions. It was at this time that the three-year medical course changed to four, and a laboratory method of teaching anatomy began largely, as I recall it, through the efforts of the late Professor Mall. Then the pendulum swung to the other extreme. No longer did the surgeon hold opera-glass clinics on a dissected cadaver. No longer was the dissecting-room work a sort of black art. In place of this, lectures became conspicuous in their absence and dissection became a day-light laboratory subject, and professional anatomists began to move in polite society. The swing to the research worker was a direct protest of those who knew, that anatomy was being poorly taught, and I will hark back to this later.

If I were to translate myself back some twenty years ago what were my thoughts and criticisms of the course in gross anatomy. I resented being kicked out of the dissecting-room after forty-eight hours' dissection of the lower half of the body, and registered my resentment by putting in several weeks the following summer with Professor Kerr in working out the relations of superficial to deep lymphatics of the axilla. The most successful as well as the most spinal piece of dissecting I accuse myself of. Successful in that Gray and I differed. I worked through the osteology with a skeleton nearby and wondered why it was so essential to know all of the wrinkles and dimples and foramina with which various bones were excruciatingly and inaccessibly beset. I went over a collection of joints and wondered what kind of eye the man had who drew those delightfully crisp ligament separations. I protested the systematic origin, insertion, innervation, and rela-

tions of the individual muscles and maintained it couldn't be done, especially when we tripped up our instructor at times. I recall memorizing anastomoses between various arteries because it seemed to me they were at one time considered important and therefore wished on to future generations. I figured the veins were easily as important and far more complicated than the arteries and why so little devoted to them in the text. The various plexuses of nerves were as nightmares, and so thoroughly did I bone their form that I could draw them upside down and backwards to prove that I really knew something of them. The brain was a chamber of nomenclature horrors, and I shone in my fraternity as the individual who had actually dissected a brain and was held, next to Gray, as the last word on the subject. Please remember I came into this work younger than most students and therefore more pliable; brought up in a museum, which may account for some of my peculiarities, then and now, but extremely eager to work and learn.

This, then, leads us to the second point I would make. One does not expect a student to swallow, digest, and assimilate all of the data of gross anatomy, and therefore some of the matter must be filtered out as more important as opposed to certain matter which must logically be less important. Essentials of anatomy do not exist. All of them are de-horned species of text-books with fewer adjectives, verbs, and prepositions. Condensation does not make for digestibility any more than bulk makes the matter more easily assimilated, and because of this we have a teacher. I take the liberty of contrasting the teacher with the research worker. Both of these individuals are a result of brains and application. Neither of them are born. Both represent men whose receptive apparatus and analytical power is or should be better developed than their motor discharge. There are, however, two requirements in the teacher which need not be found in the research worker. The first of these is a personal interest in students, and the second, an interesting personality to his students. Personal interest in students is not synonymous with research worker, and the interesting personality may make itself known in a vicarious inspiration which the student is supposed to obtain through fleeting

glimpses of a great man comparing the rotation of the extremity joints of the grasshopper with similar appendages in the cousin cricket, or what you will. Therefore, we must teach our students well because we are interested in the teaching, or not at all because we are not interested; either method is excellent and between the two lies mediocrity. If we are to select for our positions as teachers of gross anatomy those individuals whose greatest merit lies in the bulk of productive work or in the seduction of students to do a great amount of this work for them, we must not expect any marked increase in the efficiency of our teaching.

The teacher of gross anatomy of limited experience, say only five years, certainly must have developed some idea of what is more important and what is less important. The learning of the subject for itself has been abandoned together with other mind-improving ilk. Facts in themselves do not constitute knowledge. They are merely the letters which spell knowledge, information, or what you will. It is the privilege of an individual possessed of a functional cortex to limit memory largely to subconscious or sub-cortical functions. It is the privilege of the intelligent man to forget things, and the more intellectual he is the more he makes it a point to keep his mind free. It is only the idiot who cannot help remembering. We make it our business nowadays, I believe, to teach things that they may be forgotten, and if any of you are in doubt whether this is your method or not I will give you a simple formula. If, when you lecture or quiz your students, you translate your own personality and wonder what it would all sound like if you were on the benches and what you would remember of it all the next day, I maintain you belong to the desirable class. I do not anticipate approval of this method of approaching students. It would be undesirable if there was an approved method because it would show a lack of individuality in teachers which is one of the prime requirements. If, however, you feed the mental pabulum without any regard to the student's powers of assimilation; if you follow your notes year in and year out because it is the easiest way; if you cannot make your teaching the personal matter with all of its personal equation; if you concentrate your courses in your own interests rather than in those of your students: I, for

one, as a representative medical student would get little information or inspiration from your work. I hark back, therefore, to the transition of anatomy as a didactic subject to one of purely laboratory experience and refer to the pendulum coming to a more midway position. Because we have professional anatomists nowadays; because we have men of experience; because we have research workers—although prominent men in gross anatomical research are relatively infrequent; therefore we give our students opportunity to profit by experience and learn through their ears as well as their eyes. The advantage of ear learning over eye is obvious. One can't strain one's ears.

Personally, I believe that if an instructor demands more, or as much, of his students than he himself can deliver after years of experience, of observation and review; after viewing hundreds of dissections to the student's one, this individual in my opinion does not have a fundamental conception of the subject and his students will get farther through his neglect rather than his interference. How successful is each one of us as a teacher? How often do we take inventory as to exactly how good we are at it? One cannot measure the efficiency of one's teaching ability by a criterion of examination any more than one can gauge the productiveness of his research with a bibliographic calipers. It is the blissful privilege of the true teacher to be discouraged, and because of his discouragement to ever try anew. If, therefore, you are perfectly satisfied with your method of teaching or perfectly contented with the results of your research, it means you are slipping or have slipped. Personally, I teach anatomy because a student will forget it, and do not let us make the common mistake of confusing the forgetting of a thing with the never-having-known the thing.

I have thus far tried to tell something of the medical student and his resistance and his conferred or acquired immunity. I have also attempted in an impersonal sort of way to tell who is the teacher of gross anatomy. I shall next unscrew the inscrutable and tell you what we should teach, and finally camouflage the impossible by telling you how to do it. I reserve the right to deal negatively with the problem if I so choose in the interests of brevity and universal peace.

What shall we teach our students in gross anatomy? It is difficult indeed to make categorical statements on what one must do and what one must not do. Perhaps our discussion of the pedagogy of a subject would not suffer if the essayists were less theoretical and more practical. There has always been a suspicion in so-called standardized courses that the standardization consists in "not doing as I do, but doing as I tell you." Perhaps it may be a good idea and the easiest way out of the difficulty to make it a personal quantity even if the method shines negatively in contrast with your own excellent views on the problem. In the teaching of gross anatomy I attempt to do five things: I encourage dexterity in dissection; a purposeful dissection; an independence in observation; a justification of facts, and, finally, a weaving together of some sort of plot to the story of the body.

The training of a digital dexterity is a valuable asset to the medical student and it is a good thing to emphasize that it represents a sort of spinal busy work, but much good comes of it in a profession where a man is supposed to use his hands as well as his brains. Please do not misunderstand that I hold excellent dissection as equivalent to good anatomical work. We have all had students who dissect beautifully and know little of what they do and, conversely, students who dissect very poorly, but know a great deal about it. The tendency on the part of the average student is to be in too great a hurry, and I do not encourage anyone to save time any more than I stimulate them to improve their minds. It is also a bad plan to install into the heart of students that the cutting of this or the tearing of that is such a terrible offense. The only way I know to tell how much traction a nerve will stand is to pull a few of them in two. There is a very arbitrary line between poor dissection and mutilation of the dead and the essential difference is like that between falsehood and lying—the intention.

Students are supposed to be dissecting, inasmuch as the work is largely spinal, to some purpose, and this purpose, I take it, is to check on the structures as they find them in the text. The body after all is the thing and the text is merely accessory after the fact. It not infrequently happens that students see structures very

well as evidenced from the dissection (superior colliculus), and they also at the same time see things very poorly as far as the lateral geniculates are concerned. A purposeful dissection demands more than merely doing a good dissection and checking the structures found in the book. It demands an independence of observation; an interest in similar structures on the other side of the body or in other bodies.

Too much guidance—too many directions are probably worse than none at all, because the student is supposed to have some initiative. It is a good plan, I find, not to go into great detail, but let the student work it out for himself as much as possible. It is also an excellent idea to sit down with the student once in a while and show him you can do the work yourself as well as talk about it. The best way to encourage observation in a student is to observe with him and not at him or to him.

If you tell a man the earth is not an oblate spheroid, but a truncated tetrahedron, it is merely a waste of words unless he reacts and wonders why. Justification of facts to me means this: first, it leads to an understanding of the relation of structure to function; second, the information is essential to a comprehension of abnormal structure and function; third, it is of interest from a phylogenetic standpoint to one who should be a student of evolution; fourth, it bears on the fundamentals governing the developmental processes, and, lastly, certain data are important to the proper conception of cross-section anatomy.

There is no justification for the absolute divorce between anatomy and physiology or anatomy and pathology, and it may be the anatomist is not as good a general physiologist and pathologist as the latter two are anatomists. The instructor certainly cannot expect a student with less time, interest, and experience to weave a pattern out of a mass of facts when the instructor himself cannot do it. I, for one, am anxious to hear Professor Jackson's paper and Professor Huntington's paper, which ought to let no little light in on the problem, provided they tell us how and what they do. It is safe to say that details must go, and whether this artery has fourteen named branches and yonder twenty-two is of little consequence if one does not know the general territory involved. It is a good thing to know that the internal carotid has most of its

distribution inside the skull and that the external carotid is mostly outside the skull. It is folly to make the student memorize the origin, insertion, innervation, and action of muscles because the physiologist proves to him that all a muscle can do is shorten and that no muscle contracts by itself—in fact, leads him into reciprocal innervations for an answer. So the militant student comes to us for a justification, and either we hand him the worn-out adage, “Learn the thing for the thing itself,” or we explain why it is important, or we agree with him. Personally, I agree with him. The most important thing about a muscle is the position of its tendon to the plane of action in a joint. The same holds true of the details of anastomosis except from an historical interest, and the peripheral communication of nerves which, according to the physiologist, do not communicate.

Whatever may have been the sins of the academic courses, let us make what we teach to our students of a kind that will make them more receptive to later study of subjects which comprise their life work; at least let us not contribute to their resistance.

How you shall teach gross anatomy is quite inseparable from what you teach, and therefore depends both on teacher and teachee. I have said that the teacher must have an interesting personality and must be interested in the welfare of his students. The student must be receptive, and in order that he be receptive, he will expect action on the part of the teacher; accessibility of information; interpretation of importance from the teacher's standpoint, and, finally, interest and inspiration. Interpreted the other way around, the teacher must translate himself into the person of his students. The student is usually loyal and will apologize for a poor teacher by saying “there is little question but that he knows his subject.” If, therefore, we, as teachers, maintain the right to analyze how much our students know by their motor discharge, it is only fair that the student apply the same rule because a good teacher is at the same time one of his own pupils.

Next to remoteness in the person of the instructor comes inaccessibility of information. Just as I stated, too much guidance in dissection develops mental lean-to's in the students just so too much stereopticon, too much microprojection, too many

charts and museum specimens contribute to making information inaccessible to the student because we tend to make what constitutes a perfectly obvious thing remote. It has been said that the college course in physics is greatly interfered with through the chicanery of appliances and apparatus. It is just like telling a story to illustrate a point. If the story is too well told the student will remember the story and forget what it was intended to explain. It is my opinion, therefore, that the more offhand the information, the more schematic the idea, the less like the original, the better it will take; bearing in mind justification must underlie all information, imparted or required.

The next point I made was in reference to interpretation of the importance of certain facts which does not mean spinning out in an hour's lecture what a student may read somewhere in fifteen minutes. It consists in the teacher's telling the results of his own observation from his own experience and is therefore mainly matter which is not to be found in a text-book. This is a problem which requires a great amount of time and study, and this is the sort of thing that does more to inspire the student than any one other thing I know. Lectures of this kind require experience, confidence and a certain amount of philosophy, and are either to be classed as valuable adjuncts to teaching or very bad. It is much better to convince the students by precept, by word of mouth, and by action that no subject of vital interest can be difficult to a man who has the brains, the application, the facilities, and the incentive to work, but without the incentive the results are ineffective.

The advice given in a symposium like this will not materially affect us—the older men whose mental and physical habits are well formed—too well formed perhaps to allow even a moderate elasticity. Rather this recital of admonitions and experiences will do much to steer the younger men toward a more friendly personal interest in their respective flocks and perhaps for the same reason that they do their research work—because they like to do it. There is a great future ahead in this country for the man who will take the teaching of gross anatomy seriously, and will take it seriously because he likes it.