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Anatomy: Its Role Today and in the Future

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Modern anatomy can be divided into three stages. The first stage, the dawn of modern anatomy, came in the late 15th and early 16th centuries, largely as a result of the work of two men, Leonardo da Vinci and Vesalius. Vesalius was perhaps the first of the anatomy professors, who were perhaps tired of their passive role, to come down out of their Chairs and actually do some dissection themselves, thus obtaining first hand information on human anatomy. Leonardo da Vinci, with his Science of Perspective, enabled the structures, once revealed, to be transferred in a meaningful way to paper. It then became possible to preserve in concrete form, rather than only in the mind, the anatomical facts discovered by dissection. Soon it became feasible to develop a terminology. In the hot climate of Italy, without effective embalming fluids, dissection was still completed quickly and was usually limited to the winter season—a practice still often followed.

Although in early times attempts had been made to delay the onset of decomposition by the use of primitive embalming fluids such as wine and turpentine, it was not until the 18th century that William and John Hunter initiated the second stage of anatomy with their introduction of arterial embalming. This enabled much more careful and detailed dissection, and, although the surroundings in which the dissections were performed left much to be desired, anatomical museums were established. The Hunterian Museum, founded at this time in London, remains probably the best anatomical museum in the world. The law at that time insisted that all bodies ultimately be buried; the Hunterian Museum avoided this problem by being designated a graveyard. By the year 1800, dissection was becoming the norm for all medical students, and the shortage of bodies so engendered led to the activities of the "Resurrectionists." The second stage of anatomy persisted from the Hunterian period almost to the present time. It perhaps can be best characterized by "knowing more and more about less and less," or "learning the material because it is there," without regard to the usefulness or relevance of the information. Anatomy occupied anything up to 1,500 hours of the 4,000-hour medical curriculum. In defense of this time allocation, it must be said that anatomy probably contained the only accurate information in the entire medical curriculum since a high percentage of the other information imparted to the students at that time has since been proven to be completely erroneous.

With the introduction of the microscope and the new sciences of histology (microanatomy) and embryology, the emphasis on gross anatomy was somewhat reduced but it still remained considerable.

So much for the past. But what do anatomy departments do today, and what will they be doing in the future? First, anatomy has so broadened in scope that it has become fragmented into a number of subdisciplines: electron microscopy or ultrastructure, microanatomy, gross anatomy, embryology, neuroanatomy, anthropology and, in Iowa and a number of other schools, endocrinology. But that still does not tell us a great deal about what actually is done in or what is the function of departments of anatomy.

As has been stated before (Metcalf, 1970), I believe anatomy departments rightly have three main functions: to train professional students; to forward, by research, knowledge of our subject (including all of its subdivisions); and to train future anatomists and biological scientists—in particular, those who believe that the correct approach is to start with structure and deduce function. Indeed, structure is the basis of function. That principle is perhaps the core of anatomy. After all, how far could we get trying to discover the motive power of an automobile without looking under the hood?

Let us discuss each of these three functions in turn.

Training Professional Students

Who are these professional students? They consist of medical, dental, nursing, physical therapy students and other paramedical personnel. The group most intimately related to anatomy departments is, of course, made up of the medical students, so I shall consider them in some detail. The decrease in the time allotted to teaching them gross anatomy from 1,000 hours or more to 250 hours at Iowa, and considerably less in some places, has led to some feeling that perhaps anatomy is on the way out. I would strongly disagree. First, part of the apparent diminution in time has occurred by the establishment of separate courses (in anatomy departments) of embryology, neuroanatomy and microanatomy. Second, the dissecting room traditionally has been the "clubhouse" of the medical school with lots of spare time for discussion between students and students, or between faculty and students of many topics, not all relevant to medicine, let alone anatomy. With the increase in sound knowledge of subjects other than anatomy, we can no longer afford this luxury, and I venture to suggest that the decrease in the amount of time students actually spend on gross anatomy is far more apparent than real. Furthermore, in those schools which have taken the trouble to see that the anatomy they teach is relevant to the student's future career, and which take the trouble to motivate the students suitably (Metcalf et al., 1969), students and clinical staff begin to think in terms of more anatomy rather than less. However, I suggest that we have probably reached about the right length of time for the study of anatomy in the preclinical curriculum except for elective courses in special areas to meet the needs of students intending to proceed into particular specialties. At pres-

ent we at Iowa already have a number of advanced courses in gross anatomy and neuroanatomy designed to meet the needs of such groups as neurologists, otolaryngologists, orthopedic surgeons, genitourinary surgeons, orthodontists, oral surgeons, periodontologists, etc.

Research

All forms of biological research can be found in most anatomy departments. Perhaps this is best illustrated by listing a few of the research projects currently under way in our department at The University of Iowa. Represented at the 1970 meeting of the Iowa Academy of Science were three papers on applied gross anatomy research (Jacobs; Jensen; Shilling; 1970), one on the ultrastructure of an endocrine gland, the pituitary (Moriarity, 1970), one on the metabolism of another endocrine gland, the thyroid (Nissen, 1970), two on immunology and hematology (Clancy; Metcalf et al., 1970) and one on neuroanatomy (Smaha, 1970). Two areas of interest and active research in the department were not reported on—teratology and muscular dystrophy. In addition, we are somewhat unusual among anatomy departments in having several experimental programs of a research nature going on in the area of education (Metcalf et al., 1970; Torbett and Metcalf, 1970; Moffatt et al., 1970; Rolston et al., 1969), one of which was reported on at this meeting.

What is the thread connecting all of these activities? Well, except for the last group, it is the fundamental statement that to understand function one must have a detailed knowledge and understanding of structure, and, of course, research in the science of teaching anatomy must be fundamental to all of its subdisciplines.

Graduate Student Training

It is often forgotten that there are two sides of graduate student training—training good researchers and training good educators. The latter involves the teaching of course design, the writing of course objectives, the methodology of teaching, and the means and validity of methods of evaluation of students, courses and instructors, i.e., teaching teachers to teach. All of this we endeavored to accomplish in our recently established Anatomical Teaching Workshop, the first session of which apparently has been highly successful (Moffatt et al., 1970).

What of the future? I still believe that a study of the relevant structure of the human body at all levels of organization from the molecular to the gross is essential for a proper elucidation of the body's functions. Therefore, I believe that anatomy departments have a vital role to play in training students for the health professions, in elaborating more and more complex operative procedures and in developing an understanding of biological function.

Finally, I would like to say a word concerning the overall objectives of our department with respect to our students. As good educators we hope that our students will, like the proverbial college dean, leave as they arrived, "fired with enthusiasm."

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