The Medical Students' Background in Biology

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For nineteen years I have served on the Committee on Admissions at Loyola University School of Medicine. This committee has examined the academic record of some 700 or 800 students a year. Each year certain convictions grow stronger. It is not the number of hours in science that makes a good medical student; it is not any one particular science, but rather the quality and the thoroughness of the work that has been done.

In trying to evaluate the courses taken, biology is hardest to determine correctly. Courses in physics are fairly well standardized. One at least can be sure it is a mathematical course. Is there not some special significance in the fact that books by Sir James Jeans, and others of the same type, are so extensively read by the adult population? Such persons passed their course in physics but apparently failed to get an explanation of the physical phenomena about them.

The courses in chemistry are given in a satisfactory sequence, but much more extensively than needed, so much so that in some colleges and universities it is impossible for premedical students to major in any other department. This is unfortunate indeed.

It is in biology, however, that the examiner of credentials is almost compelled to close his eyes and just hope. A course in biology may be anything remotely concerned with life. There isn't another science course in the curriculum which presents such variability in content and emphasis. Even comparative anatomy, so fundamental to medical students, is presented by two types, the smallest possible number for comparison. Biology and English are the outstanding handicaps of the first-year medical student. About one-fourth of all first-year medical students fail.

It is with the hope of stimulating your interest in our common problem that I write at this time. I say common problem because, with the reduction of hours in the medical curriculum and the extension of time in the undergraduate years, more responsibility must be thrust upon the departments of arts and science. The student must comprehend more quickly, organize and assimilate data more readily, be able to correlate, place emphasis, demonstrate initiative and above all be able to read and express his ideas acceptably.

Nowadays we properly oppose strict standardization of any educational process. Individualization in these matters offers the greatest opportunities for advancement, individually and collectively. However, we eventually face the fact that in order for a student to follow intelligently the subject matter of any given professional course, certain fundamental knowledge is necessary.

As far as biology is concerned, I believe most medical faculties would agree that the following fundamental knowledge is necessary for the best end results:

The anatomy and general physiology of the animal cell.
(The plant cell can be profitably added)

The fact that the cell is the unit structure of our bodies, emphasizes the importance of knowing the anatomy of a typical cell, the importance and function of each part; the influence of environment and heredity, the sex chromosome theory, cell division, growth, modifications of part or all of a cell; specialization to form tissues; how the functions of the various systems of a complex organism are carried out in the protozoa or a single cell; the fundamental requirements of living matter. This will require a careful study of living amoebae and paramecia as well as fixed cells.

The genesis and phylogeny of the germ layers.

Through a study of protozoa, volvox, hydra and earthworm, it is possible to trace the beginnings of germ layers (ectoderm and mesoderm) together with their contributions to the various structures of complex forms higher in the phylogenetic scale. Thus a broad background is laid for human anatomy and embryology.

The morphology and phylogeny of the various anatomical systems with their general physiology.

A study of the changing form, structure and general function of the various anatomical systems (skin and its appendages, skeleton, muscular, nervous, vascular, digestive, respiratory, urinary, reproductive, endocrine) through a variety of different animal forms gives the premedical student an understanding and orientation for his work in human anatomy and physiology that is indispensable.

The significance of environment, heredity, eugenics and evolution with a general understanding of the criteria for animal classification.

A physician must be able to advise and guide intelligently his patients, when they seek his ministration, on heredity, eugenics and evolution. These subjects are not taught in medical school, but are taken for granted. Too often students fail to grasp points because they have no such background.

Separate courses in bacteriology and general physiology are very unsatisfactory as premedical courses, because they are necessarily superficial courses and spoil the approach for this work in medicine. The premedical preparation should be background, foundation material, and not "preparatory" in the sense of being introductory to anatomy, physiology and bacteriology. A course in histology which has as its aims, actual acquaintance with simple histological technics and an introductory study of simple tissues, is valuable. Likewise, a course in embryology which deals with each of the early stages of development (fertilization to germ-layers) in invertebrates or lower vertebrates, or both, and a comparative study of placentation and gestation, is very valuable. Work in advance of that indicated under histology and embryology is definitely contraindicated for premedical students.

Many "interest provoking and sustaining" laboratory demonstrations and some "student project work" can be and should be introduced, e. g., the circulation of blood in the web of a living frog's foot; the early development of the chick (primitive streak to 72 hrs.); frog sperm and eggs, fertilization, cleavage; growth and resorption in the tadpole's tail (by transillumination); changing the chemical, electrical and temperature environment of living amoebae and paramecia; and so on until the student really knows what work is and is prepared to meet the grind of medical school.

Finally, may I suggest that you who are charged with advising premedical students, can render superior service to them if you require the last courses in chemistry and biology in the year just preceding entrance to medical school.