Chemical Pathology

Finally, turning to chemical pathology, for the general course of practical instruction in examination of blood and urine from different types of cases it has always been found a good plan, if accommodation is available, for students to be able to carry out examinations on patients whom they are looking after in their medical and surgical appointments. While this tends to be a nuisance to those in charge of the laboratories, there can be no doubt that many biochemists of distinction to-day have entered the subject through this portal. In some institutions the students actually perform the routine investigations on the patients. In my experience this puts far too much strain on the students, and the results cannot be relied upon.

If the continuity of teaching is maintained, the student will appreciate it fully when he comes to his chemical pathology. If the scheme outlined has been properly implemented he will fall on the urinary steroidal examination in adrenogenital syndrome almost with relish and will start his studies of diabetes and other metabolic diseases with interest based on sound chemical knowledge. Another advantage of such co-ordination is that it enables the institution to provide interest for the teachers of inorganic and organic chemistry. If they are in the same department as the teachers of biochemistry and chemical pathology they do not lose sight of their students, and then they have the stimulus of research work in that they are in constant touch with biological material. This is very different from the old regime in medical schools where the teacher of inorganic and organic chemistry had no connexion whatsoever with those dealing with biochemistry and chemical pathology, being segregated in a separate department.

Conclusion

Anyone who attempts criticism of the medical curriculum or points out faults in the existing system of teaching exposes himself to a battery of criticism, and this applies doubly to the person who is rash enough to publish his article in a journal permitting correspondence. There is no doubt that many of those who read these brief notes will be tempted to write at once and say that these objections certainly do not apply to their particular university or medical school. I trust that those who are kind enough to study my remarks will understand that they are meant in an entirely general sense, and that there must be institutions where some or possibly all of the defects are avoided or minimized.

The Dutch have long realized the limitations of their own language as a medium for scientific expression. In the 17th century Leeuwenhoek was sending accounts of his discoveries to London for publication in English in the *Philosophical Transactions*, and as recently as 1947 English was chosen as the most suitable language for the series of abstracting journals published in Amsterdam under the title of *Excerpta Medica*. Dutch surgeons have now commenced publication in English of a new journal for their specialty, the *Dutch Archives of Surgery* (*Archivum Chirurgicum Neerlandicum*), which is sponsored by the Dutch College for the Advancement of Surgical Science. By this new journal surgeons in Holland hope to enjoy the advantages of international criticism and a broader interest in their work. Papers will be published in French or German also, but manuscripts submitted in Dutch will be translated into English. The journal will appear quarterly, at an annual subscription of £2 2s. The agents in this country are Messrs. Baillière, Tindall and Cox.

ON THE TEACHING OF BIOLOGY AS A PREPARATION FOR MEDICINE

BY

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It is most unlikely that further discussion concerning this particular topic can yield conclusions significantly different from those presented in the 1948 Report of the B.M.A. Medical Curriculum Committee. Nevertheless it is perhaps desirable that such discussion should proceed, since in spite of the appearance of this most admirable report there is still much disputation and not a little misunderstanding both among medical students and among their teachers concerning the contribution which biology makes, or is expected to make, to the education of the future practitioner of medicine.

Aims of the Curriculum

The structure of the curriculum and the place of biology within it cannot be considered profitably until the aims of the curriculum are known. They certainly are not solely the production of the general practitioner, that lowest (or highest) form of professional life, the specialist in some particular branch (or twig) of medicine, or the medical scientist (physicist, chemist, anatomist, physiologist, pathologist, bacteriologist, biochemist, pharmacologist, and the like). There would seem to be a general though occasionally hesitant agreement that the product is meant to be a person who, in virtue of his initial organic endowment and early upbringing and as the result of his exposure to this curriculum, has become fitted to pursue further study and thus ultimately equip himself with that constellation of qualities, personal, social, and professional, that is necessary for the kind of work he proposes to do and for the kind of life he proposes to lead. Graduation is thus the starting-point for a career in one of the three major provinces of medicine. The graduate can proceed thence to become a medical scientist whose hope is to advance knowledge in a particular field of medical science, a specialist in medical practice dealing with some particular part of a human being in relation to the rest of him (for example, an ophthalmologist; a specialist in the utilization of some particular technique demanding a mastery over some particular complicated machinery and of value in diagnosis and therapy—e.g., radiology; a specialist in some particular field of medicine—e.g., public health), or a generalist in medical practice concerning himself with the total individual in relation to his total external physical and social world.

So far as the future practitioner of medicine is concerned, the aim of medical education is to produce out of an individual with the appropriate personality, aptitudes, and inclinations an educated person. He must be fitted to claim his proper place in the society of which he is a co-operative member and be equipped with the special outlook, knowledge, and skills which will enable him to render service of a special and expert kind to the community; this service taking two main forms—the skilful application of his special abilities to the immediate task of conserving, augmenting, and restoring the health, happiness, and efficiency of individuals or of a community, and the expansion of the special corpus of knowledge which is medicine by additions thereto gleaned from his own activities and experience.

Groundings in General Science

To medicine can be given several definitions, every one of them plausible and attractive. But for the purpose of this particular discussion let it be granted that, in the main, medicine in action, the practice of medicine, is the application to human and social affairs of medical science (that part of scientific knowledge which has its bearing upon medical theory or its application in medical practice). Medical science is a part of general science but has an added vocational value. It is but reasonable, therefore, that the future practitioner of medicine should receive an adequate introduction to those disciplines which are grouped under the heading of medical science. Since medical science is science, it is equally reasonable that the student should receive an adequate introduction to science itself.

The curriculum as we know it is divided into three interrelated parts: (a) an introduction to general science (with special reference to physics, chemistry, zoology, and biology); (b) a grounding in the sciences on which the theory and practice of medicine rest (anatomy, physiology, biochemistry, bacteriology, pathology, pharmacology, etc.); and (c) an extensive introduction to the theory and practice of medicine (total medicine applied to the affairs of an individual patient, of a series of these, or of a group). Since group (b) rests on group (a) it can of course be argued, and quite commonly and rightly is so argued, that in the ultimate analysis the sciences on which the theory and practice of medicine are based are physics, chemistry, and biology. However, let this pass. All that this present approach demands is the acceptance of the view that the teaching of medicine is not to be detached from the teaching of science and that the practice of medicine is not to be undertaken by anyone who is unacquainted with science.

There is another reason why an introduction to general science should be included in the medical curriculum. The history of our society is from its beginnings, and especially since the Renaissance, the narrative of science in application, and the possibilities of the continuance and further development of our way of life depend on the even more intensive application of science to its affairs. The practitioner of medicine is a citizen as well as a doctor, and as such should be well informed concerning these matters. Furthermore, it must remain impossible to understand the place which medicine occupies in our society until it is understood in what ways and to what extent science has shaped our social philosophy and has fashioned our social aims, and in what ways and to what extent the prevailing social philosophy and aims have moulded the philosophy of medicine.

The promulgation of the theory of evolution and its general acceptance produced great changes in our concepts of the world, of mankind, and of disease. Man, who had been a puny creature imprisoned in a hostile, narrow, and incomprehensible world, whose heart had been chilled by fear and whose mind had been blinded by superstition, was liberated. His world became a potentially hospitable, friendly, bountiful environment which could be shaped by him to satisfy his every physical need. Man himself became part of organic nature, a product of a continuing evolutionary process. Neither he nor the social institutions which he had invented were final static things. He could hope to gain the knowledge concerning them that, translated into power, would enable him to change them according to his desire. Disease, formerly to the masses the handiwork of demons or the sign of the wrath of an outraged, malevolent, and implacable deity, became the manifestation of a disharmony between man and the other

components of an oecological system of which the human being was but one member. Disease was the outcome of ignorance; it was undesirable, unnecessary, preventable, and often curable. It was a barrier standing between man and his own self-selected goal and was therefore to be removed.

Science grew because it gave to man in increasing measure the power to control the forces of his external and social world. It grew because it came to be recognized that before individuals and nations could hope to realize their spiritual desires they must enjoy a certain level of material comfort and security. Science in application has made possible the material welfare of mankind. But it has done far more than this. It has given to mankind great hope and the possibilities of great dignity. The medical sciences have grown because man came to desire health and freedom from pain and anxiety, and because these sciences have given that for which the people yearned. Medicine has grown because it has shown itself to be one of the most potent tools that a society can use for the achievement of certain of its aims—the creation of a physical environment ridded of its disease-provoking agencies and propitious for the full growth and expression of man's inherent qualities.

For these reasons alone it is imperative that the student of medicine shall know what science is. He must be so attracted and impressed by the teaching to which he is exposed that he shall become and remain a scientist (in outlook at least).

Purposes of Biological Training

Biology, used as a branch of science to illustrate the whole, offers certain advantages. The student himself is aware of the biological nature of his own existence. Among the sciences it is biological science that seeks an understanding of the nature of human personality and answers to the questions—Whence came man, what is man, and what is to be his terrestrial destiny? The relative attractiveness of the biological sciences to the student is perhaps evidenced by the fact that failures in the first professional examination are invariably fewer in the case of zoology than in chemistry. Perhaps the student finds the examination easier because the subject is inherently more attractive (?). Other reasons for this difference—the ones that usually satisfy the chemist—can of course be adduced.

The content of the course and the method of its presentation are matters which have to be left to the teachers themselves. Doubtless they realize full well that the attractiveness of the apostle as a person is no less important in the matter of gaining adherents to a point of view or to a field of inquiry than is the beauty of the creed he presents and represents. If courses in zoology and botany respectively are offered by different university departments, as is usually the case at present, then it is imperative that the two should be most carefully integrated.

Perhaps it is correct to say that what their colleagues of the later years of the curriculum desire of the teachers of the biological subjects is that the ultimate purpose of their teaching shall be:

(a) (in common with the physical sciences) to show that scientific knowledge is a special kind of knowledge, systematized and formulated and secured by the employment of certain particular modes of inquiry; to show that scientific inquiry rests on the warrantable assumption that among the circumstances and events in the world around us there is to be discerned an orderliness, a regularity, in the character or relations of certain classes of facts and events; to show that science is the product of human reason applied to the phenomena of nature and that it is that human interest and activity which

seeks to disclose this orderliness, this regularity, and to explain it; to exercise the student in the methods of science—the logical methods of reasoning, inductive and deductive, and the technical or technological methods of manipulation and measurement (including the elements of statistics); to exercise the student's curiosity in the stream of natural events that flows past him; to encourage his capacity for imaginative speculation (and his capacity to hold this in check); by every possible means to interest the student in the higher values of science—e.g., the aesthetic quality in scientific thinking, fairness in judgment, openness of mind, scepticism, intellectual honesty, dispassionate observation, critical discrimination; to contrast the relative values of reward in the form of wealth, security, social elevation, popular acclaim on the one hand and on the other the calm delight that comes from the contemplation of the harmonies of science and the exaltation that follows upon scientific discovery;

(b) (the special contribution of the biological sciences) to stimulate, excite, and satisfy the student by giving him an understanding of the theories of evolution, of the cell and of the gene, and of the impact of these theories upon human thought and action; to demonstrate the interdependence of Nature and nurture; to display the astonishing variety of biological inventions by means of which different types of living things function more or less efficiently—e.g., inventions relating to respiration, alimentation, reproduction; to trace the development of the animal society and to contrast the social life of animals with that of man; to demonstrate the essential harmony that exists between habitat and inhabitant and the effects of the disturbance of this harmony; to present the concept of the oecological system.

Much of what is here suggested might appropriately be offered in an arts course preceding the entrance of the student into the medical curriculum proper. Many of the topics listed may seem to belong to the territories of moral philosophy, logic, or aesthetics. But for the majority of medical students there is no such arts course, and so the responsibility for explaining these topics must be accepted by the teachers within the medical curriculum. There is no valid reason why the student should be the loser by this arrangement.

At present the complaint is all too commonly made by medical students that the courses in zoology and botany are a waste of the student's time; they are held to be useless because they do not seem to help in the cultivation of the bedside manner and because they postpone unnecessarily the contact between student and cadaver or patient. There is gross and grave misunderstanding here, and it is for the teachers of the first year to remove it. The mind of the medical is more important than are his medicaments.

A Privilege and an Adventure

Participation in the medical curriculum is a privilege, an adventure, a mounting excitement as knowledge is added to knowledge and understanding expands. If not, then it ought to be. What surely is required is that the first-year teachers shall hand on to those who follow students whose initial experience of the university has exceeded their wildest hopes, whose inclination towards medicine as a career has been strengthened, and whose mental outlook and habits have been profoundly affected as the result of their contact with science and the scientist.

It is a privilege to take part in the making of a doctor, since he can be such a force for good in open society. To bore him in his first year is as great a crime as to discourage his idealism in his last year. It is imperative in these most critical days to arouse his faith in science as a means of human and social betterment. We are afraid of the power with which science has endowed us. Out of this fear has emerged a widespread pessimism concerning

human nature and human motives. In this course the student should be presented with the evidence which shows that man's dominion over the other species rests on his scientific knowledge concerning them. He should be invited to examine the evidence which points to the conclusion that, thanks to science and to science alone, it has become possible both theoretically and practically for mankind to build a world based on common effort for common good in which the powers which science gives will be used for beneficent purposes. He should be confronted with the proposition that the recent explosive growth of science has made it impossible to set limits to the directive capacity of man or to predict how far he may extend his dominion over his external world and over himself.

Believing in the perfectability of the human mind and loving his fellow man, the doctor, holding to the view that to expanding scientific knowledge there is no discernible limit, can do much to treat that most serious disease of mankind to-day, the pessimism which destroys man's faith in man and robs the future of all hope.

THE TEACHING OF ANATOMY TO THE MEDICAL STUDENT

BY

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Clinicians constantly complain that students on entering the hospital wards for the first time show a lamentable standard of anatomical knowledge. At first sight this would seem to be a severe condemnation of the teaching in the preclinical years, but there are certain factors which modify the value of the criticism. The clinician is, as a rule, a specialist in one branch of medicine or surgery, and his knowledge of the minute anatomy of the part of the body in which he is particularly interested is very extensive. If the roles were reversed, and the student were allowed to question the teacher on general anatomy, it might be that the report would be equally severe.

Because of the frequency with which these complaints are made, it is natural that the student's ignorance of the minute points of regional anatomy is accepted as proof of a weakness in the teaching of the subject.

Many attempts have been made to bridge the gap between the subject of anatomy as a basic science and its application to the clinical work which is the object towards which the training of the medical student is directed. In most schools young clinical teachers from the medical and surgical sides of the university have been appointed as lecturers in the anatomical department with the object of changing the bald anatomical facts into a living picture. These efforts have been to some extent successful, and the student is instructed by the clinicians in those points of anatomy which are considered to be of the greatest clinical significance.

The clinicians emphasize particularly the alterations in form and relationship which occur in the various organs as a result of their normal and abnormal functional activities, and they lay stress on the importance of the surface markings of the various organs and bony prominences.

In spite of these efforts at improvement the weakness still remains; the student takes little interest in this important