and of great value to the many family doctors who flocked to Atlantic City, partly for a yearly "brush-up" of their medicine and partly as a social occasion.

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MEDICAL PROGRESS AND MEDICAL EDUCATION*

BY

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If we go back to 1900, a date which Singer believes marks as definite a period as any in the annals of medical history, we find medicine still a body of empirical knowledge, based on and developing mainly from the accumulation of bedside observations during life and anatomical studies after death. The laboratory had, it is true, begun its meteoric career in medicine, but we have it upon the authority of Sir Henry Dale that in 1900, when he began his own undergraduate clinical studies, the relation between laboratory and ward was one of "critical aloofness on both sides."

It is important to try to see the physician's aims at that time through his eyes. If he honestly pursued his calling—and most did—he regarded himself not so much as a curer of disease but more as one whose duty it was to help the patient by assuaging his symptoms and easing his mind. Nature was the Great Healer, the physician her handmaiden, ardent in his study of her ways, and skilled in anticipating her intentions; ready to perceive the first signs of recovery and to point them out with hope; quick to recognize the harbingers of evil so that he might prepare for a fatal outcome he could not avert. Perhaps he was sometimes a little pompous, but he was usually sincere, sympathetic, and genuinely interested in his patient's welfare. It is doubtful if he ever stood higher in the public esteem than at that time. His remedies were, almost without exception, empirical and based on bedside experience and tradition. Some were, by chance, effective—mercury, digitalis, and quinine are examples; some, such as salicylates and morphine, were valuable in the relief of symptoms; a few were soundly based on scientific experiment—for instance, thyroid extract, first used by Murray in 1891, and diphtheria antitoxin, discovered by von Behring in the same year.

Throughout the next 50 years the gap between laboratory and ward has grown less and less, and the methods of experimental science have, as Sir Henry Dale has said, "so permeated medicine that it has itself become almost an experimental science."

[The lecturer then surveyed briefly the advances of chemotherapy and immunology, and the new knowledge of vitamins and hormones.]

*An abridged version of a lecture to the Section of Odontology, Manchester Medical Society, given on February 25, 1952.

Perhaps more important, on account of its scientific implications, is the tremendous change in the approach to diagnosis which has come from advances in technical and laboratory medicine. The vast contributions of radiology and of the clinical laboratory to diagnosis are only aspects of this change, which goes down to the roots of medical diagnosis. In chest diseases, bronchoscopy, bronchography, tomography, and thorascopy have greatly helped the growth of chest surgery. In heart disease, angiocardiology and cardiac catheterization have taught us much about the physiology of disease processes and have led to the more precise diagnosis of those cardiac lesions that can be attacked surgically. The introduction of electrocardiography in the earlier years of the century, and its growth towards the stature of a science in the past 10 years, have helped in the diagnosis and understanding of coronary disease in particular. In neurology, air encephalography, arteriography, and electroencephalography have given important aid to the development of neurosurgery. In gastroenterology, radiology has proved especially valuable and gastroscopy and sigmoidoscopy have helped in accurate diagnosis. Studies in electrolyte and water balance, with the extensive laboratory facilities they imply, have proved of great therapeutic importance in many medical and surgical conditions. The list of advances is endless, but all I wish to do is to give scale to the extent of the change.

The Scientific Attitude of Mind

The effect of these changes upon the attitude of mind of the doctor has been profound. In the old days a physician went round his ward and, on the basis of empirical experience, issued authoritative opinions which none could gainsay. If the chief said a patient had Fallot's tetralogy, to all intents and purposes he had, for nothing short of a post-mortem examination could alter that label. It may have meant little in practice, but it lent to medicine the atmosphere of an authoritarian art. Criticism and independent thought and judgment were stifled. To-day it does not matter very much what the chief says, the merest houseman may confound his careful clinical argument with a little sheet of paper from the laboratory or x-ray department. That is all to the good; the heavy cloak of authority is cast aside, and the spirit of free criticism enters and vitalizes the atmosphere. Considerable intellectual readjustment has been required of the doctor now that scientific proof of the diagnosis is expected, if at all possible, and the treatment is based, at least in part, upon scientific grounds, often, as with antibiotics and anti-coagulants, requiring careful laboratory control to make it effective and safe. So great has been the change that we may well wonder whether our ways of thinking have kept pace with the growth of our technical armamentarium, and whether our use of medical science is any better than the use of the weapons of science in general in the modern world. Do we rule them, or they us?

There is something more in this change than the mere introduction of scientific remedies and diagnostic tests to assist the operation of the medical art, for art it remains, as I hope to show. There is the need, and even the necessity, for the adoption of scientific habits of mind by clinicians. It has often been held that the introduction of science into medicine has led to a loss of the old skill in diagnosis by the unaided senses. There is a much greater danger than that—the danger that the clinician will fail to appreciate just how to use the scientific aids to medicine; that he will attach more importance to them than he should, and tend to regard them as penny-in-the-slot methods of getting a quick answer. Unless he adopts scientific habits of mind he will tend to read too much into the precise scientific data presented to him. To take a simple example: we know that when certain

changes appear in the electrocardiogram, myocardial infarction has almost certainly taken place. There is not too much difficulty there. The difficulty arises if the clinician goes on to infer that if these changes are *not* present myocardial infarction has *not* occurred and lets this inference sway his clinical opinion. That this assertion would have to be proved by quite a different set of scientific data would be immediately apparent to anyone accustomed to scientific ways of thinking, even if he was unfamiliar with the technique of electrocardiographic research.

Unless the clinician is adequately trained in scientific method it may be difficult for him to recognize the limited significance of the laboratory data presented to him. It is no part of the scientific method to draw deductions outside the exact significance of the ascertained data; if the clinician deduces too much, that is not the fault of the introduction of science into medicine, but is due to the inadequate scientific education of the medical student. There are no two ways about it—if we are to use scientific methods in medicine, and we must, then we must also inculcate scientific habits of thought in the clinicians who interpret scientific data. So one consequence of medical progress is the necessity to train the medical student fairly fully in scientific habits of mind, and this has certain repercussions upon the pattern of medical education, to which I shall return.

The Dangers of Modern Therapeutics

Although our rapid therapeutic advances have conferred immeasurable benefits, they also carry with them certain risks to the patient. The present-day physician is provided with a very wide range of exceedingly potent and highly dangerous drugs. As Dunlop has recently written, "We have become Jove-like in our ability to hurl therapeutic thunderbolts." The difficulty with thunderbolts is that they are rather difficult to aim and sometimes do more damage than their author intended. So it is that when we prescribe sulphonamides, thiouracil, or gold injections, we are sometimes faced with agranulocytosis or aplastic anaemia, which may be more dangerous than the disease we set out to treat. Anticoagulants have led to fatal haemorrhages, cortisone to serious endocrine disturbances and heart failure, intravenous cardiac depressants to sudden death, hexamethonium to distressing hypotension, streptomycin to permanent deafness, mercurial diuretics to severe salt depletion—and the list might be extended indefinitely. It has been said that all effective drugs are dangerous, and that statement has at least a basis of truth.

Nor does the story stop there, for in order to use our therapeutic remedies effectively the burden of most highly technical diagnostic procedures is thrown upon both doctor and patient. Not only do these methods occupy much of the physician's time and skill but they often cause the patient additional suffering and not infrequently endanger his life. Air encephalography, cardiac catheterization, cerebral and cardiac angiography, bronchoscopy, and bronchography are examples of distressing and sometimes dangerous procedures. The doctor has the great responsibility of deciding when the information gained in these ways justifies the suffering and risk, and to do this he requires not so much knowledge as judgment and understanding.

The Growth of Specialism

The development of technological medicine has led to the inevitable, but most dangerous, growth of specialisms. Specialism has indeed great dangers, and the first of these is the tendency for the specialist to believe that he, and only he, is competent to deal with the diseases which fall within his field. The more complicated the technological problems, the more willing is he to accept this point of view. So far, the specialist physicians have not succumbed to this temptation so much as the specialist surgeons. The danger of this attitude is that, if carried far enough, it will lead to the disappearance of the general physician. At least

the specialist surgeons have left the area between the xiphisternum and the pubes (in the male) to the general surgeon, though they have added the proviso that he must not interfere with the kidneys, ureters, bladder, or prostate, and he will certainly suffer for it if he touches the sympathetic nervous system or the spinal column. But if all the specialist physicians insisted upon their so-called rights there would indeed be no place for the general physician. The day may yet come when there will be no physicians to whom a patient may be safely referred in the knowledge that it will not be forgotten that heart failure may be due to severe anaemia, or that a woman's indigestion may arise from her husband's habit of spending half his wages on drink. The general physician is vital for the future welfare of medicine, for without the broad outlook for which, at his best, he stands we may lose much in gaining the advantages of medical technology. One of his most important functions lies in the training of medical students, for he, more than others, should stand for the art of medicine, an art so much in danger of being lost in the almost uncontrollable tide of medical technology.

The second danger that besets the specialist is that he may become so wrapped up in the technical methods of his specialty that he neglects the essential function of every doctor—to care for the welfare of his patient as an individual. Then he is mere technician. If he wishes he can preserve, within his own limited field, the best qualities of a doctor. The danger is that there may be attracted to the specialties those who rank medical technology above the art of doctoring. To my way of thinking, the principal justification for specialism is that it limits the scope of the technical methods with which the doctor must be thoroughly familiar, and so enables him to devote more of his energies and interests to the art of medicine. Unfortunately, it is rapidly becoming true that if we are to give adequate attention to both science and art in medicine we can do so only if our field of medical science is somewhat restricted.

The third danger of specialism lies in the ease with which the specialist gets out of touch with current thought in fields other than his own. Unless he consciously sets out to keep reasonably up to date in general medicine, he will often fail to recognize treatable disease in a patient when that disease is "not in his line." He must know when to seek help from other specialists or general physicians. He has a duty common to all practising doctors: to accept responsibility for the whole welfare, mental and physical, of patients entrusted to his care, and not only for disease of the organ with which he is primarily concerned.

Perhaps the attitude to specialism I am trying to express is best put in the words of one whom I believe posterity will rank as an outstanding physician of our time, though himself a specialist. John Parkinson wrote: "The common duty required of a physician lies in the recognition and treatment of disease. If he enlarges his study to cover life as affected by disease and masters the psychology of the individual sick in body, he will widen his usefulness and reach a fuller life for himself as a physician. He will dare to enter into the mind of the patient with imaginative sympathy, proving himself a friend in need. To professional skill he will join warmth and understanding. By doing so, and only by so doing, will he accept the whole burden and fulfil his destiny. If anyone seeks happiness, here it may prove to be. It is the second mile enjoined in the text, 'And whosoever shall compel thee to go a mile, go with him twain.' The good physician will accompany his patient to the end of the road."

Medical Education

The present state of medical knowledge seems to me to demand that the student should be adequately trained as a scientist. At the same time the present trends in medical practice seem to make it more desirable than ever before that he should truly appreciate the arts of doctoring, and in

the rush to acquire technical training the arts of medicine are apt to be overlooked unless they are consciously taught. The burden of both disciplines would be heavy enough, but there is worse to come. Medical knowledge has accumulated very rapidly in recent years, and as each major advance has come to be accepted we have included it in the medical curriculum. But I fear that we have not always discarded much, and certainly not a corresponding amount, of the old material. I think it fair to say that, in addition to what the student ought to learn, he is still assimilating some irrelevant and out-of-date knowledge. The word "irrelevant" is particularly important, because the medical course has been altered piecemeal, each department changing its teaching without much co-ordination between it and other departments. This is inevitable in any growing body of knowledge, and it may well work out in the end, if the change of subject-matter is not too rapid. But the change in medicine has been so rapid as to be almost revolutionary, and I think we have become too uncoordinated as a result.

For these reasons—some inevitable, some avoidable—the learning burden on the medical student has greatly increased in recent years. In the past British medical teaching has always been based on the system of apprenticeship, with all its impalpable influences of example and personal contact. But it is a system that demands time for learning, and time has become shorter and shorter in the medical course. The student of to-day appreciates the teacher who organizes his facts in simple order and insists on the student learning them as, in the old days, poetry was learnt—by heart. Such a teacher is the man to get him through his examinations. The student can scarcely be expected to realize what some of his teachers may forget, that when he qualifies it is not so much what he knows that matters as how well fitted he is to learn by his subsequent experience, and how well equipped he is to sift and assimilate the new diagnostic and therapeutic advances which will certainly come during his practising lifetime. It may once have been true that the practice of medicine did not greatly change between qualification and retirement, but nothing could be further from the truth now. The student who qualified 20 years ago has since had to learn a great deal to remain even tolerably efficient. Of course there are aids to this necessary postgraduate learning, but the doctor must have a fairly well developed capacity for critical thought and judgment. It is this capacity to examine critically new ideas, to select those worth while, and to incorporate them in the body of his knowledge which alone justifies the claim of the doctor to be a member of one of the learned professions.

Capacity for Critical Thought and Judgment

One of the primary objects of medical education is therefore that common to all true education—to develop the capacity for critical thought and judgment. Teaching which has this aim is Socratic at root, and the way it works was recently well expressed by the warden of an Oxford college in a letter to his successor 100 years hence. He wrote: "Take nothing for granted, but throw nothing overboard before you start. Bring out into the light all the dogmas, prejudices, and casually acquired opinions that swarm in your mind. Examine them, discuss them, criticize them. If you think hard and honestly enough, you will find that by rejecting some and modifying others you can develop a truer and more objective idea of the world." The terms in which this is phrased make it particularly applicable to the humanities, but the use of this type of technique in clinical teaching was described by Franciscus Sylvius, who introduced bedside teaching in the seventeenth century. He wrote: "I have led my pupils by the hand into medical practice, using a method unknown at Leyden, or perhaps elsewhere; that is, taking them daily to visit the sick at the public hospital. There I have put the symptoms of disease before their eyes; have let them hear the complaints of the patients and have asked them their opinions as to the causes

and rational treatment of each case. Whenever differences of opinion arose among them concerning these things, I, in a quiet way, pitted against each other those holding different opinions, in order that they might mutually satisfy themselves by examining all aspects of the matter, finally giving my own judgment regarding the various views. With me they confirmed the happy results of treatment, if God rewarded our labours by the return to health of the patients, or assisted in the examination of the cadaver when the patients finally paid the inevitable tribute of death."

These two statements seem to me to hold the germ of true education—as a derivation of the word implies, the "leading out" from the student those qualities of mind and perception of which he is often himself unaware, and in so doing developing his capacity for critical thought and judgment. It is in the student's own gradual recognition that he possesses these qualities, and in his enjoyment of them that the teacher gets his reward for patience.

A Liberal Education

But, as the Oxford warden went on to say, an educational system impregnated by this outlook has certain features and consequences: "It demands leisure. Its maxim is: look after the useless and the useful will look after itself: intelligent criticism is a better preparation for life than a mere load of facts or a set of prematurely formed opinions." I feel pretty sure that it is also a better preparation for medical practice in the fullest sense. I do not for a moment suggest that a doctor is not fit to practise if he is not liberally educated, but only that he will be the better doctor if he is. I also suggest that, so far as it is possible in the medical course, the medical student should have the opportunity of a liberal education. But can the medical course provide a liberal education in addition to a technical training? Himsworth recently discussed this problem and came to the conclusion that "a unified course of study in clinical medicine and in the preclinical subjects together, constitutes the basis for a liberal education in an unusually full sense of the term."

Personally, I think he goes too far. It was, I believe, Cardinal Newman who coined the phrase "liberal education" when he propounded his well-known views on the purpose of a university. He believed that just as a comprehensive scheme of physical exercises, in themselves of no practical value, can train and develop all parts of the body so that it becomes equipped to cope with a wide variety of unforeseen physical situations, so a comprehensive scheme of intellectual training can develop the mind so that it is ready to deal intelligently with the unforeseen problems of life. The subject-matter for intellectual training is not important, except that it must cover a wide field of mental activity if it is to fit the student to cope with the very varied problems he will have to face. It is from this point of view that we must try to judge the scope of the medical course as a field for liberal education. I should like to be able to agree with Himsworth when he says that the subject-matter of the medical course is wide enough, but I doubt whether it is.

There is another equally important aspect of the educative value of the medical course: how we teach is as important as what we teach, and perhaps more important. As Himsworth pointed out, the essential difference between a technological training and education is that the aim of a technological training is to impart existing information of a particular subject, and it is concerned with the future only so far as it anticipates the application of this knowledge to known or foreseen situations. An education in that subject, however, is essentially concerned with the development of ability to form judgments in the unforeseen situations which will arise as the subject advances, and it strives to do this by training the student's capacity for critical thought. Education is the concern of the university, not technological training. So, although we may not be able, within

the medical course, to provide a *liberal* education, we can, if we teach in the Socratic tradition, at least provide a *medical* education.

If we enlarge the scope of medical training a little by including the historical development of medical thought we may get a little nearer a liberal education. With the same object, the university might demand more in the way of a general education in the schools and less training in the sciences as a preliminary to medical education. It seems very doubtful whether science as taught in the schools to-day helps much in education, liberal or scientific. The personal influence of the teacher upon the student is, of course, essential in any form of true education. A tutorial system and the extension of bedside teaching of small groups of students are the obvious ways of enhancing that. Clinical and clinico-pathological conferences will help to demonstrate to the student the merits of discussion as a learning method, especially if he is encouraged to play his part.

Need for Changes in Medical Education

I believe that the time has come when we must face the problems of medical education afresh, in the light of the great changes in medical practice. Medicine now changes so rapidly that technological training alone will not enable the student to cope with the advances in diagnosis and treatment that will occur in his practising lifetime, and he has never been more in need of scientific education. Nor do I believe that scientific education is enough, for many of the situations he will have to face in practice will arise from those human problems common to everyone, but often brought to the doctor for help. In these problems I do not regard psychiatry as an adequate substitute for education, for the way a man is educated determines what he is, whereas the study of psychiatry may only enhance what he knows.

The need for a review of the whole scheme of training of the doctor, including his school education, medical education, and postgraduate education, in an attempt to reorganize and integrate it so that it reflects the changed outlook in the practice of medicine is, I believe, now apparent. But before this can be undertaken we must formulate our ideas of the objects we want to achieve and the sort of doctor we want to produce. That is what I have been trying to do. I hope that what I have said will help to emphasize the desirability of a medical training which is an education, and the importance of laying a good deal of stress on the cultivation of the arts of medicine, as well as the science. Perhaps we may even try to make the medical course as liberal an education as its limited subject matter will allow.

But, whatever changes in medical education seem to be desirable, my main point has been that the rapidity of medical progress has not been matched by an equally rapid reorganization of the medical course, so that, by unplanned incorporation of more and more technological training, we are tending to lose the essential educative character of the medical course. The result is that, only too often, the final-year medical student reaches a state of mind which reminds us of Cardinal Newman's description, written a hundred years ago, of "those earnest but ill-used persons who are forced to load their minds with a score of subjects against an examination, who have too much on their hands to indulge themselves in thinking or investigation, who devour premise and conclusion together with indiscriminate greediness, who hold whole sciences on faith, and commit demonstrations to memory, and who too often, as might be expected, when their period of education is passed, throw up all they have learned in disgust, having gained nothing really by their anxious labours, except perhaps the habit of application."

The longer we leave the present situation, the worse it will get. Let us take warning from the words of Francis Bacon: "He that will not apply new remedies, must expect new evils; for time is the greatest innovator."

PROBLEMS AND RESPONSIBILITIES OF THE UNIVERSITY SURGICAL UNIT*

BY

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As my theme for this lecture I have chosen with some diffidence the "university surgical unit," and my purpose is to discuss its special functions and the special problems which confront it. The past 25 years have brought great changes to the structure of the hospital and specialist services, and these have brought in their train many new problems, two of which I shall discuss in some detail. But first let me outline what I take to be the principal tasks of a university surgical unit.

Care of Patients

The first and pre-eminent charge is the clinical care of the patients admitted to its wards. This means that whatever other qualities the staff possess they must, above all, have wide surgical training and experience. In addition, there must be free consultation within the unit about the management of cases, and specialist opinions must be readily available and readily sought. A weekly review of the progress of all cases in the unit is of first importance, and each quarter those cases which have ended fatally should be discussed in retrospect after a full pathological report has been obtained. Only in this way are errors of diagnosis or management kept continually in the forefront of unit affairs, and every member of the team profits by each individual's experience.

Closely bound up with the clinical care of patients is the keeping of adequate clinical records. The notes must be full enough to be of value in subsequent analysis, and must be typewritten to be legible. It is one of the great paradoxes of the hospital services that clinical records of the progress of the patients for whom the hospital was built are traditionally in longhand and usually illegible, while the records of the hospital kitchen, dispensary, and workshop are invariably typewritten. There must be a satisfactory disease index system so that analysis of cases becomes simple and convenient. For all this a unit secretary is an essential member of the clinical team. She should be in charge of all case records and be responsible for filing and indexing, for the production of records when required, and for the communication of information to the general practitioner. Casual secretarial help is of little value in this matter. It is essential to have someone who takes a personal pride in the standard of record-keeping in the unit.

Instruction of Students

The second responsibility of the university surgical unit is the instruction of students. Here it is pertinent to inquire why students should be taught surgery at all. Surgery is essentially a craft, a manual occupation, and sometimes a laborious one. I must confess to having had serious qualms about its right to be admitted as an academic discipline. It is certainly true that only a small minority of medical students are attracted to its practice and still fewer ever become surgeons. Why should instruction in surgery not be restricted to those who after qualification decide to take up surgery?

There are three principal reasons why undergraduate instruction is essential in the present state of organization.

First, the original role of surgery has changed and, instead of being content to carry out operations at the request of

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