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A REVIEW OF THE MEDICAL CURRICULUM.

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THE most difficult problem in the medical curriculum is the result of the growth in the medical sciences which has taken place during the thirty years of this century, for the medical student of 1930 is required to know much more than his predecessor of 1900. Physics and chemistry have expanded as a result of a series of progressive revolutions, and physiology has increased its territory. Relatively new branches of medical science, biochemistry and pathology, have so grown and developed that they claim a share of the student's time equal to that allotted to the older branches of biology, and psychology demands admission to the league of medical sciences.

During the clinical period the student's difficulties have been greatly increased by the progressive and inevitable tendency to specialization. New and highly technical methods of diagnosis have been devised, utilizing the x rays, the electrocardiograph, and applications of chemical and bacteriological methods. New forms of treatment have come into being, based on radium, different types of light, and systems of remedial gymnastics. New departments for the treatment of single diseases such as tuberculosis, or groups such as the venereal diseases, have appeared. The older-established special departments have intensified their demands on the student's attention. The time allotted to clerking and dressing may not be curtailed, but there are limits to the compass of the human mind, and the student may easily be distracted from the study of general medicine and general surgery by the diversity of the technical methods of diagnosis and treatment which have been elaborated in the special departments. Preparation for the Final Examination has not been made easier by the regulations of those qualifying bodies which require certificates of attendance at courses of instruction given in special departments.

The minimum period of study required by the General Medical Council is five years, although it was common knowledge before the war that at least six years were needed to obtain the medical degree of several English universities. In the last decade of the nineteenth century the student spent his first year in the acquirement of an elementary knowledge of chemistry, physics, and biology, the next two years in the departments of physiology and anatomy, and his last two years in the wards. But before the close of the century many intending medical students began the study of chemistry and physics at school. During the ten years which preceded the war the medical curriculum became more and more congested, and when the war ended it was obvious to everybody that something ought to be done. The General Medical Council reviewed the curriculum. In the presence of deans of medical faculties, of professors, and of other duly appointed representatives of the universities and medical schools of Great Britain and Ireland the five years "box" of the medical curriculum was opened, and its contents were examined.

Within were found the numerous parts of the curriculum cut and shaped and arranged like the pieces of a Chinese puzzle so that they exactly fitted the box. The pieces were taken out, and each piece was handed to an appropriate committee to be reshaped, but, when the time came to reassemble the pieces of the puzzle, it was found that most of the pieces had got much larger, and all the pieces could not be got into the box.

The clinicians pointed out that of the minimum period of five years three had in the past been devoted to laboratory work and only two to work in the hospital; a minimum period of three years' clinical study subsequent to the examinations in anatomy and physiology was ordained. The two years allotted to anatomy and physiology could not be curtailed; what was to be done with chemistry and biology? It was clear that the period of medical study must be extended. On financial grounds an extension of the minimum period of medical study seemed inadvisable or inopportune, so it was camouflaged, and remained five years, but no boy was to be allowed to become a student until he had passed an examination in chemistry and physics. The first stage of the medical curriculum was relegated to the public and secondary schools. The change in this direction had begun, of course, long before the war, and many universities had permitted or encouraged intending students to prepare at school for the First M.B. Examination. But the General Medical Council made a distinct and far-reaching step when it required an examination in chemistry and physics as a preliminary condition to registration as a medical student.

To-day the work necessary for a medical degree or qualification falls into three periods or stages.

1. A period of about two years at a public or secondary school devoted to the study of chemistry, physics, and often biology.
2. A period of two years in the dissecting room and laboratories of a university or medical school.
3. A period of three years of clinical study in a hospital.

If allowance is made for failure at examinations or illness, the average period of study may be nearer eight than seven years. Are these years spent to the best possible advantage?

The School Period.

The General Medical Council does not enforce the registration of medical students, and each university or qualifying body is free to make its own regulations for the study of elementary chemistry, physics, and biology. It may include these subjects within its own curriculum, or permit or require candidates to pass examinations in these subjects before admission to the medical school. But unless the student has completed the prescribed courses in elementary chemistry, physics, and biology, or the greater part of

them, before he enters a university or medical school, he must be prepared to spend an extra year at the medical school. He must in a sense start a year behind the men of his year. A student who has completed chemistry and physics, but not biology, may be handicapped by time-table difficulties.

The position is emphasized at Oxford and Cambridge, where medical students have an opportunity of taking a degree with honours in natural science. For the examinations for these honour degrees there is a time limit of terms from matriculation, so that a student who has to devote his first year at the university to First M.B. subjects is handicapped a whole year in competition with men who are able to start preparation for an honours degree in their first term. In some cases students after leaving a public school spend a year at the medical school of a London hospital in order to pass the First M.B. Examinations of the University of Cambridge, and then proceed to Cambridge in the following year. Boys who intend to study medicine are usually advised to complete the work of the First M.B. or a similar examination before they enter a university or medical school; that under present conditions the advice is wise none can doubt.

One result is that the general education of the medical student stops at a very early age; while he is still very young he specializes on the science side of his school, and begins to cram for a series of pass examinations in elementary science. A boy of ability can pass an examination which entitles him to matriculate at a university or enter a medical school between his fifteenth and sixteenth birthday. In too many cases the passing of the matriculation examination means the end of general education. It may be argued that a boy who can pass one of these examinations has proved that he has had a good education. A boy who can just pass a university matriculation examination has attained a reasonable but not remarkable standard of general knowledge. But the point is that boys destined for professions other than medicine continue their general education for one, or two, or perhaps three years after they have passed a matriculation examination. The medical student loses two or three years, and the best years of his life at a public school, the years spent in the upper forms of the classical or modern side. There are still some who hold, as the author of this article holds, that a classical education—the discipline of the Greek and Latin tongue—is the best training for science, and for every other profession. But among those who will not go so far as this there may be some who will admit that a knowledge of literature and language, and the power to express thought clearly in speech and writing, are far from negligible assets to the scientist and the medical man. We are proud to think that we belong to a learned profession, and we have sanctioned a system which tends to put a premium on illiteracy.

On the other hand, it may be doubted whether the school-boy gets good value for the last two years of his school life if he devotes them almost entirely to First M.B. subjects. It has been said often enough that natural science is better appreciated at the university than at the school age; under the aegis of a university department rather than in the form room of a public school. There may be something in this point of view, although it must be admitted that not all university teaching has the quality of inspiration, and science is excellently taught in many schools. But it is true that preparation for the First M.B. takes longer at school than it does at a university. Preparation for the First M.B. at school occupies about two years, and school terms are longer than university terms. A certain number of boys after two years of science at school are unable to pass the First M.B.; they have, however, done enough to become bored, and they have lost their interest in science.

One of the great difficulties which confront the schoolmaster is the fact that each university has a separate schedule and syllabus for its First M.B. Examination; this difficulty is marked in the case of biology. In the case of the matriculation examination universities accept one or other of the examinations conducted by the joint university examination boards, and the schoolmaster can choose one examination for all his pupils. It is difficult for a school-

master to prepare a number of boys in one class to meet the varied requirements of the First M.B. Examination of a number of universities. If boys are expected to pass the First M.B. from school, the universities should agree to form a joint examination board to provide a common First M.B. Examination.

There has been a tendency to raise the minimal age at which a student may be admitted to a university or medical school; nevertheless, we allow schoolboys, aged 15, to begin preparation for professional examinations. The study of natural science at school is one thing, the assimilation of knowledge with the immediate object of passing an examination is another. On the other hand, it has become very difficult for a boy to remain on the classical side of a public school until he is 18 or 19, and then begin the medical curriculum after he has matriculated at a university. Thirty years ago many students entered a laboratory for the first time in their first term at a medical school. To-day a boy who has postponed the commencement of science until he enters the university is at a great disadvantage as compared with his contemporaries, and must work very hard to catch up. It seems a pity that the choice of medicine as a career must be made so early. It is a serious matter if the medical profession is to lose recruits who have had the great advantage of a general and unspecialized education. If preparation for the First M.B. must be undertaken at school the syllabus of the examination should be so framed or cut down that the necessary work should not occupy more than the last year at school.

The Medical School.

The chief characteristic of the medical curriculum is the lack of co-ordination between the various subjects of which it is composed. The curriculum may be divided into three stages or strata: (1) the elementary study of physics, chemistry, zoology, and botany; (2) the more intensive study of human anatomy, and physiology; (3) the practical study of the recognition, prevention, and treatment of disease. Between these three principal strata are two huge clefts, and numerous subsidiary fissures divide the subjects included in each stratum.

The effective control of each subject remains with the professor or head of the department, but, as a general rule, professors of chemistry, physics, zoology, and botany are not medical men. The attitude of the professor of chemistry, for example, towards the faculty of medicine is perfectly clear, perfectly logical. From time to time, in one medical school after another, the medical faculty or one of its members, greatly daring, asks the professor of chemistry, "Could you manage to adapt your First M.B. course to the needs of the medical student?" The professor of chemistry replies, "Do you want your medical students taught chemistry, or do you not?" The answer is "Yes." "Very well," retorts the professor of chemistry (and who will blame him?), "I know what chemistry is and you do not; I settle the syllabus." In practice the conversations are more polite and protracted. The attitude of the professor of chemistry is not unreasonable, and it is not easy for the medical man to explain to the chemist the needs of the medical student.

Occasionally the professors of pure science are more complacent, and meet their colleagues of the faculty of medicine more than half-way. A professor of chemistry has said, "We teach the medical student the structural formulae of all the more important drugs." A professor of physics remarks: "I quite understand; you want the medical student to know about the physics of the x-ray coil." A professor of zoology proposed to include in his elementary course for medical students an account of the structure and life-history of parasites. These examples are quoted to show how difficult it is for non-medical teachers to understand the needs of the medical student. The technical applications of science must come later; the medical student in his first year needs the fundamental principles of the natural sciences. His labours are lightened when his teacher can abstain from examples which illustrate the applications of science to other trades and professions.

After the examinations in elementary science the student begins anatomy and physiology. The transition from the general biology of the zoology department to the stern realities of the dissecting room is abrupt and often unmitigated; there is room for correlation here. But the thing which every medical man remembers about anatomy is the number of hours which must be spent in the dissecting room, and the number of hours which must be spent before the required details can be committed to memory. To many, if not to all of us, who are not professional anatomists, it seems that the student is required to master details, some of which are essential neither to the concurrent study of physiology nor the subsequent comprehension of medicine and surgery. Certainly much of the anatomy which the student knows at the time of his examination is forgotten within the next three years, and much of that which is forgotten is never missed.

Anatomy is not, of course, the only subject which fades from the memory when the examination is passed, and it may be necessary to learn a great deal of anatomy in order that some may remain in the memory. But after a conference of anatomists with teachers of other subjects it might be possible to reduce the time spent on dissection, and on the acquirement of a knowledge of topographical anatomy. For the technical methods involved in the dissection of the various parts are essentially the same, and the mental processes involved are those which depend on a visual memory. After one or two parts have been dissected, further dissection brings no new experience to brain or fingers. If it is necessary that the whole body be dissected some remission of knowledge of detail may still be possible.

During the last thirty years medicine has been coming closer to physiology, and physiology has, on the whole, become less medical. During the nineteenth century the functions of organs in health were determined in many cases by observations made on hospital patients in whom these organs were diseased. Physiology in those days depended in part at least on observation, and not as yet entirely on experiment. The dependence of the study of the normal on the study of the abnormal was obvious; physiology had its origin in medicine and pathology.

Few branches of natural science have developed more rapidly during the last forty years than physiology, and this country has good reason to be proud of the great men who towards the close of the last, and at the beginning of the present, century, made English physiology famous throughout the world. In 1908 a well-known German chemist said to the author of this article, "physiology is really (*eigentlich*) an English science." The great development of physiology as a branch of experimental biology has affected the relation of physiology to medicine, and the attitude of physiologists to the medical student. Students destined for medicine, as they passed through the physiological laboratory, have been fascinated by the work which they saw in progress and have remained to become "unqualified" physiologists. Who will blame them? Medicine has been the loser. Physiology, emancipated from her "mother" Medicine, contracted closer alliances with chemistry, physics, and mathematics. The human body came to be regarded as a maze of semi-permeable membranes inhabited by electrolytes and colloids. Physiology moved towards chemistry and physics, and away from anatomy and zoology. The interest of physiologists in histology, and the relation of microscopic structure to function waned, and the gap between anatomy and physiology, between structure and function, widened. For the education of the medical student the correlation of anatomy and physiology can hardly be too close. Does the modern student look on the physiological laboratory as the place in which he studies the functions of the organs which he sees in the dissecting room?

On the other hand, advances made by physiologists in the first quarter of this century have been of great and direct value to the physician and the surgeon. The physician of to-day is probably more interested than his predecessor in the application of the methods of the physiological laboratory to the diagnosis of disease. Every branch of science must change its ground if it is to change

its point of view. Change is necessary to progress, and there has been progress. But for the sake of the medical student who must learn many subjects within a relatively short period of years correlation of subjects is always an urgent necessity.

A reviewer of the history of medicine might point with justice to the development of chemical methods in the medical and biological sciences as one of the great events of the last thirty years. Etiology and diagnosis, prevention and treatment, have all benefited by the introduction of chemical methods. Nearly all critics of the medical curriculum insist on the urgent need of more instruction in chemical theories and methods. To-day the student is taught elementary inorganic chemistry at school; a short course of elementary organic chemistry is taken at school, or more often at the university. Organic chemistry is the subject of a special examination. A gap, more or less unbridged for the student, separates the organic chemistry of the department of chemistry from the physiological chemistry or biochemistry of the departments of physiology or biochemistry. At a late stage in the curriculum instruction is given in the chemical laboratories of some hospitals on chemical methods of diagnosis. Instruction in chemistry is imparted to the student in instalments. But the progress which has taken place in the knowledge of chemistry as applied to biology has resulted not so much in the correlation of the chemistry of living with the chemistry of non-living matter, as in a divorce of biochemistry from its intimate partnership with physiology, pathology, and medicine. Biochemistry, which started as chemical physiology, has become an independent branch of biology. Physiology, pathology, and medicine are not the only branches of biology which have problems which may be solved by chemical methods. Zoology, botany, and agriculture have chemical aspects and interests. Biochemistry is no longer a part of the department of physiology, but has become consulting chemist to all biological departments. How has the development of biochemistry affected the medical curriculum and the medical student? In this consolidation in one department of all the chemical interests of all branches of biology we may study some of the problems connected with the correlation of the subjects of the medical curriculum.

The medical curriculum has been regarded as divided into three periods or strata, after the fashion of a jam sandwich cake—the elementary science layer, the physiology and anatomy layer, and the hospital practice layer. There is chemistry in each layer. Now it is well known that the integrity of a cake must be destroyed by any method of section. But if the pieces are kept well together the appearance of a complete cake may be preserved. Difficulty in keeping the pieces together must arise when cutting in two planes is allowed. If the chemist or biochemist is permitted to cut out a slice, like a slice of plum cake, which contains the chemistry of all the three layers, the layers are going to suffer. It is difficult to teach physiology or pathology or medicine unless the chemical aspects of these subjects are treated as an integral part of these subjects. A man should not teach pathological chemistry unless he has a good knowledge of chemistry; it is equally true that he should have a good knowledge of pathology. The example of chemistry in its relation to biological subjects is instructive to the student of the medical curriculum, and illustrates the difficulties of the correlation of subjects.

The grand cañon of the curriculum separates anatomy and physiology from surgery and medicine, a vast gulf across which it has been the pathologist's ambition to build a bridge. The days have gone, no doubt, when the student on his arrival from Oxford or Cambridge at a London hospital was congratulated on his knowledge of science and advised to forget it as quickly as possible. Nevertheless the gap between the laboratory and the wards is still big, even though, to-day, willing hands are stretched out to help the student over. Medicine has never been quite certain whether she regarded herself as a science or an art, and her indecision is reflected in the curriculum. The M.B. course of a university starts as if the goal was a B.Sc. with honours in biology. The last years are devoted almost exclusively to clinical instruction of the most practical kind. The student is apt to regard all examinations

up to and including those in anatomy and physiology as a series of preliminary tests which must be passed before he is allowed to begin real work in a hospital. He has spent two years, perhaps, in the laboratories at a public school, and two years at a medical school; does he bring with him to the wards the equivalent of four years' experience and training in natural science? Attempts are made, it is true, to enable the student to make the best use of such knowledge as he may bring with him. Classes are given in some medical schools during the clinical years in applied physiology and anatomy. The medical and surgical units are essays in the combination of laboratory with clinical methods.

Of all the subjects of the medical curriculum pathology is best placed to help the student in the co-ordination of his experiences of normal and abnormal biology. Now Pathology, the youngest daughter, has made herself so useful that Mother Medicine has been very unwilling to allow her to grow up and become an independent science and have a house of her own. But Mother Medicine has kept Pathology at home with her in the hospital to look after the mortuary and the museum, and to cut sections and write reports on tumours. Later on, Pathology taught herself to prepare culture media, grow bacteria, make vaccines, and to perform chemical examinations. Pathology has been an extremely useful maid-of-all-work, and on winter evenings, after the work in the wards is done, the students, if they are not too tired, come to her that they may be told something of the laboratory methods by which certain diseases may be diagnosed or treated.

In the majority of the universities of Scotland and England a formal course of pathology occupies a portion of the student's time during the twelve months which follow the examinations in anatomy and physiology. These courses coincide with the first year of hospital work; they are over too soon, before the student is in a position to correlate medicine with pathology—the study of disease in the ward with the study of disease in the laboratory. The student is apt to regard pathology as the last of the long series of obstacles which he must surmount or evade before he is permitted to devote his attention to medicine.

In the London schools the time devoted to systematic instruction in pathology is less than in the North. In some hospitals an introductory course in general pathology and bacteriology is given during the first three months of clinical work. Courses, possibly slightly more ambitious, but of a very elementary and introductory character, are given at Oxford and Cambridge in order that medical students may have some notion of pathology before they migrate to a London hospital. Students, after they have begun clinical work in the wards, have little time and little opportunity for the study of pathology. Morbid anatomy can be learned in the post-mortem room. In some hospitals pathological clerkships in connexion with clinical laboratories afford chances of acquiring practical experience of useful diagnostic methods. Lectures are not always given during the same term, and often bear no relation to courses of practical instruction. There is too little co-ordination of the teaching of morbid anatomy with morbid histology, with bacteriology, and with chemical pathology. Pathology is presented to the student as a laboratory branch of diagnosis. The examinations in pathology which form part of the Final Examination in the London University, at Oxford, and at Cambridge are often regarded by the student as an additional examination in a special subject—as an added burden. The examination in pathology at Oxford is a part of the Final Examination, but may be taken as a separate part before the examination in the clinical subjects. There can be no other three subjects within the whole medical curriculum so nearly allied as medicine, surgery, and pathology, no other three subjects which offer such opportunities for co-ordinated teaching; to the student, then, pathology, medicine, and surgery should be one subject. Pathology is not an introductory science, nor is it a system of laboratory diagnosis to be learned at the completion of the usual period of clinical study; it is the study of disease by the methods of the laboratory, just as medicine and surgery are the study of pathology by the methods of the wards. It is desirable to

begin the study of disease in the laboratory at least as early as it is begun in the wards, and laboratory study should be correlated with ward study throughout the clinical period.

It is neither within the scope of this article, nor within the powers of its author, to discuss details of clinical teaching. Practical instruction in medicine and surgery must be the backbone of the curriculum, and the product should be a man skilled in the prevention, diagnosis, and treatment of disease. This article is concerned with the branches of natural science, some understanding of which is essential to the study of medicine and surgery. But it appears that within the period of clinical study influences are at work similar to those which have been discussed in connexion with the period of laboratory study. There has been a comparable increase of knowledge, and a comparable tendency to specialization, with the splitting off of special departments concerned with certain diseases or groups of diseases, or with special methods of diagnosis or treatment. There is a tendency to insist on certificates of attendance at each special department, and demands are made from time to time for special papers on special subjects, and the appointment of special examiners. Taken by itself the case for each of these special subjects may appear incontrovertible. But if the claims of all the special subjects were admitted in full there would be little time within the three years' period of clinical study for general medicine and surgery.

In all medical schools lectures are given on forensic medicine, and on preventive medicine and hygiene; some universities insist on special examinations in these subjects. The standard of knowledge in forensic medicine which can be demanded of a medical student hardly seems to warrant the dignity of a special examiner and a special paper. From the nature of the subject practical instruction can only be fortuitous, and it does not seem necessary that the burden, admittedly a very temporary burden, of details derived from a textbook or lectures should be added to the student's heavy pack. The importance of preventive medicine is beyond dispute. But the prevention of disease is the concern of every teacher of medicine, surgery, and pathology; it does not seem reasonable to isolate the prevention of a disease from its etiology, diagnosis, and treatment. If the lecturers on medicine, surgery, and pathology fail to deal with the prevention of diseases on which they lecture, they must fail to do justice to the subjects committed to their charge. Candidates should be, and in fact are, examined in preventive medicine by examiners in medicine, surgery, and pathology, and there is no need for a special examination in this subject.

The object of the medical curriculum is to provide a training for medical men, the majority of whom will spend their lives in the practice of medicine and surgery. Training in the diagnosis and treatment of the sick is provided by the practice of a general hospital, and the problem of the medical curriculum is to provide the best possible foundation for clinical work. At Oxford and Cambridge students are encouraged to take advanced courses in natural science leading to a B.A. with honours, and at other universities exceptional students take additional courses in science and, at the expense of an extra year, secure the B.Sc. degree. A generous education in the natural sciences, and especially in one or more of the branches of biology, is the best possible preparation for the study of medicine. Men well grounded in the theories and methods of the natural sciences make the best recruits for the medical profession, and may be expected to provide pioneers, research workers, and teachers. There will always be a need for men of this type, and always work for them to do. But the bare minimum of professional knowledge and experience which every student must acquire before he passes a qualifying examination has increased and is increasing, and if the medical student is ambitious to reach the standard of an honours degree in pure science—the same standard as is required of a non-medical student of science who is unhampered by concurrent professional examinations—and satisfy all the requirements of the medical curriculum, he must be prepared for very strenuous work and a considerable addition to his years of training.

It is of the first importance for the future of the medical profession that facilities for advanced training in the natural sciences should be available for those medical students who are able to take advantage of them. It is important that every encouragement should be given to medical students to devote additional years to the study of science from an unspecialized and non-professional standpoint. From this point of view the less the connexion of the science which is studied with medicine the better. Men whose training before they enter medicine has been generously broad will bring new ideas with them into medicine. But not all medical students become research workers or teachers, and not a very large proportion of students have the inclination, time, or money for additional courses in science. A love of pure science for pure science's sake is not the only, and possibly not the most important, quality for success in general practice.

What should a man know before he is allowed to begin clinical work at hospital? It is desirable, but it is not essential, that he should be up to the standard of a B.Sc. with honours. In the case of the majority it would be unreasonable to suggest anything of the kind; but in practice we do require that every medical student shall take a series of courses and examinations in various branches of natural science which amount in all to about the standard of a pass B.Sc. The standard required is not high enough to ensure that the student is a good scientist, but it may well be much more than the amount of preliminary training necessary to make a good doctor. A hundred years ago or so it is believed that the sum total of all the natural sciences was so small that the larger minds then living could hold it all. At the end of the last century it was possible for a student to spend two or three years in the laboratories, and then two or three years at a hospital, and feel at the end of five or six years' study that he had covered a reasonable proportion of natural science and medical practice. To-day three hard years of work at a hospital are barely enough, if they are enough, for the acquirement of the essential minimum of clinical experience. The time may not be far distant when another year will be added to the period of clinical study. Before these three years must come two years of work in the dissecting rooms and the laboratories of a medical school, and from one to two years' work in the laboratories of a public or secondary school.

Does the student get full value or even a proper equivalent for the three or four or more years of laboratory work which he must do before he enters the wards? For the majority, for those who have neither the time, nor the ability, nor the wish to take full advantage of the advanced courses in natural science which universities provide, it would be a great advantage if the necessary minimum of compulsory preclinical laboratory work were substantially reduced. A reduction would involve a most careful consideration of the kind and amount of knowledge and experience which every student must possess before he is allowed to begin clinical work.

That the preclinical laboratory work of the curriculum is in urgent need of consideration and revision few will doubt. Definite expressions of opinion are needed from all responsible for teaching medical students and especially from those who teach during the period of hospital practice. From these opinions information could be obtained as to what might be included with advantage and what might be excluded from the curriculum without loss. In all probability the period of preliminary laboratory study might be reduced. Even if no reduction of time should be found possible, it seems almost certain that the time might be better spent, and the training in the laboratory better adapted to its object—the preparation of the medical student for the practice of medicine. The day has passed when the student could be allowed to browse at leisure for a few years on the pastures of pure science before he was harnessed in earnest to the chariot of Aesculapius. Above all there is need for co-operation between the teachers of the various subjects, and correlation of the subjects taught, so that the relation of the various subjects to one another should be obvious to the student. All the courses contained in the curriculum should be co-ordinated to form an ordered sequence. At present the student is

required to attend classes and pass examinations in a number of apparently unrelated branches of science; he is given to understand that the assorted knowledge which he gains will be of value to him later on. In any case much of the value of the training is lost from the hurry, strain, and stress involved by the long series of examinations by which the student is harassed from an early age, and which rob him of much of the pleasure and profit which he might derive from a more leisured study of the natural sciences. The medical student is examined far too often, and in consequence more of his time is spent in cramming than in profitable study. One great advantage which would result from a shortening of the period of preliminary laboratory study would be an increase in the time available for general education. It is useless and almost scandalous to prescribe an age limit below which boys may not be registered as medical students, and at the same time make the passing of examinations in elementary science a necessary preliminary to registration so that schoolboys are in fact required or advised to begin professional study one or two years before they may be registered as students. It would be a distinct gain to medical education if no incentive was offered to schoolboys to work for professional examinations before their last year at school.

In any consideration of the laboratory work which the student does at the medical school, the arrangement of the laboratory subjects and their relation to clinical work in the time-table might receive some consideration. Is it essential or even really advisable to insist on the completion of the study of anatomy, physiology, and biochemistry before clinical work is begun? The student would take a far greater interest in anatomy and physiology if he had come in contact with patients in a hospital, and was in a position to appreciate for himself the importance and significance of these sciences. How much of the student's laboratory work should be preliminary to his admission to the wards? The correlation of medicine and surgery with anatomy, physiology, and pathology during the whole or the greater part of the five years of the curriculum would offer great opportunities to both teacher and student. The advice "Study this carefully and you will be rewarded by finding the knowledge very useful to you in a few years" is part of the regular stock-in-trade of the laboratory teacher in the faculty of medicine. There seems no valid reason why the study of morbid anatomy should be postponed until the study of normal anatomy has been certified as complete by examination. Some reference to disease, to pathology, and to medicine is essential to an understanding of physiology. The observation of changes produced by disease should be supplemented by the study of lesions produced by experiment. Could there be anything but gain if the teaching of normal physiology to medical students was continually illustrated by examples of abnormal structure and function shown in the wards and post-mortem room of a hospital? The most elementary course on metabolism, on biochemistry, or on physiological chemistry must be illustrated by the consideration of diseases of the ductless glands. Would the student take less interest in biochemistry if he was allowed to see living examples of deficiency diseases, or to obtain and examine for himself specimens from a case of diabetes? The opportunity for co-ordination of the subjects of the curriculum is great, and the need for active co-operation between teachers seems evident.

In conclusion, the author of this article is aware that it is presumption for any one individual to attempt a review of the whole curriculum and all its diverse and distracted elements. Of the errors of individual judgement this article must afford innumerable examples. On the medical curriculum, which spreads over so many years, and comprises so many and so different subjects, it is certain that individual teachers will hold and occasionally dare to express various and divergent views. All the greater is the need for the expression of individual opinions, imperfect and one-sided though they be, for consideration and for co-operation between all whose duty it is to share the great responsibility of training young men for the profession of medicine.