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THE HUXLEY LECTURE ON CLINICAL SCIENCE WITHIN THE UNIVERSITY*

BY

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I

In response to the invitation with which you have honoured me, I am going to plead before you to-day that the biological science in which I am interested should be given fuller university status. It is a special privilege to be allowed to bring these views to a university closely engaged in considering problems of medical education, and in a lecture commemorating a man universally recognized as a chief pioneer both in science and in education. But though Thomas Huxley gave his brilliant mind to the search for and diffusion of knowledge in physiology and in other branches of biological science, his interest was not directed to studies of human disease. For this reason you will perhaps permit me to turn for a moment to his distinguished contemporary, James Paget, who, at first similarly attracted by biology, was subsequently drawn on to become a noted investigator of disease in man and a most gifted surgeon. It was the development of Paget in this direction which enabled him, while very conversant with contemporary biological and physiological thought and fully alive to its importance, to make these deliberate and weighty statements in speaking of clinical work:

"I feel sure that clinical science has as good a claim to the name and rights and self-subsistence of a science as any other department of biology; and that in it are the safest and best means of increasing the knowledge of diseases and their treatment. . . . Receiving thankfully all the help that physiology or chemistry or any other sciences more advanced than our own can give us, and pursuing all our studies with the precision and circumspection that we may best learn from them, let us still hold that, within our range of study, that alone is true which is proved clinically, and that which is clinically proved needs no other evidence."

I use these clear and memorable sentences of sixty-five years ago, with which I find myself thinking in such close accord to-day, to introduce the matter of the present address. In using the term "clinical science" Paget thought exclusively of researches upon living men. I shall use this same term to convey his meaning, but shall widen it, and define clinical science as the branch of knowledge that centres upon diseased human beings, but which also includes directly relevant parts of the allied sciences. The central field of work is the human patient; and this will remain the field peculiar to the science. But work will often extend to more distant boundaries; these will include human physiology, because the normal is the control to the diseased man; will include the morbid anatomy and the bacteriology of man; and will include "experimental medicine," which has come especially to mean such experiment upon the lower animals as is inspired by clinical problems.

I am putting before you the idea that clinical science *so defined* should find its place and acquire proper status within the university. It has sometimes been pointed out that what I have spoken of as clinical science is not clinical medicine and clinical surgery as these are practised, and that certain of its activities might justly be termed physiology or pathology. I know that this is so. The distinction between the science and the art of medicine is intentional; they should be kept as separate ideas, and regarded as separate directions of human endeavour, in working to practical ends; though it is to be said that there is no wish to infer that the science and the art can never be pursued by one person. By intention, too, distant boundaries have been fixed. To give independent strength to the science it must be unhampered in its movements. The boundaries between individual sciences may not be maintained rigidly without hindering progress; overlaps between clinical science, pathology, and physiology are vital to medical science as a whole; they bind together three activities, which in process of time have grown too far apart from one another. We are here engaged in discussing a serious practical question—namely, the relation of the university to branches of knowledge that concern the health of mankind. The university cannot successfully enter this field of activity without setting up within its own domain a strong scientific department inspired by direct clinical interests.

In attempting to picture clinical science within the university, the relation and attitude of the several medical sciences to each other obtrude themselves. In recent times discussion has sometimes turned from mere statements of achievement, possible and real, to a comparison of the merits of these sciences, or to a comparison of the relative importance of the contributions from ward and laboratory. These two comparisons are of course distinct, for in many of its activities clinical science is to-day essentially a laboratory science. I understand by a laboratory a place well equipped with apparatus and other facilities for working by special and quantitative methods; I cannot accept the common notion that a laboratory is a place to which animals but no patients are admitted. It is proper and necessary periodically to describe and emphasize the mass of knowledge that mankind undoubtedly derives both from the physiological laboratory and from the clinical ward with its associated laboratories. But an attempt to assess the relative merits of these different activities swings discussion from useful into controversial channels, and simultaneously diverts attention from central truths—namely, that the merits of these various forms of work are not in fact comparable, and that both clinical science and physiology, both ward

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work and laboratory work, are absolutely and therefore equally essential to the attainment of those practical goals towards which all groups of workers in these fields are striving. The sciences considered form a closely interconnected series, which should be encouraged to grow as one harmonious whole. To the more applied science, any growth in the purer science that nourishes it is a gathering of its own ultimate strength; and any growth in the applied science promises to the work of the purer science a surer fruition. The welfare of each member of the series is highly important to all other members; the general strength will largely find its measure in that of the weakest component. Here, therefore, is the strongest motive for mutual good will and support. Nothing will more quickly bring the allied medical sciences into close understanding and sympathy, which from every standpoint is so desirable, than that they should be placed upon just the same footing within our universities; it is essential to this purpose that each should be founded on the cardinal principles, which shape sciences universally, and that each should possess scope sufficing to give independent strength.

II

It is necessary to my main theme to show that clinical science has the power to contribute abundantly to progress, and this leads me on to speak briefly of the broad relations of this science to problems of human disease. Studies of disease cannot begin until disease is recognized and in some measure understood; real knowledge of disease is derived only from disease itself, it is not built up in the form of concepts of perverted function. No human disease is known to be curable until man has been cured of it. It is in the very nature of things that, in its initiation and in its culmination, work relating to human disease must be done on man himself. Once the problem has been formulated, and before the final work on man is done, in a middle phase, study may become diverted to the lower animals. Such work, provided that it still concentrates upon the problem of disease, is still within the province of clinical science, as this has been defined, though, be it granted, it would fall without under a narrower definition. But under one or other definition the facts here briefly stated bring us to comprehend that the opportunities of clinical science in guiding and co-ordinating work as a whole are unique.

Notable advances in the practice of medicine and surgery come chiefly out of work concentrating upon the main problem studied in its natural environment, rather than from researches of a more remote and recondite kind. These latter are not to be placed upon one side as unimportant, or even as less important, to progress: but their influence is less immediate; they provide us with methods of precision; they suggest to us tests to employ and experiments to undertake; they help us much in explaining and appreciating the manifestations of disease and the mode of action of our remedies. But the management of disease is rarely to be deduced from first principles; it is the direct approach that attains swift success. The value of facing the problem directly has been illustrated repeatedly. When Pasteur was called to investigate fermentation in wine, the disease "pebrine" in silkworms, and the disease anthrax in sheep, he dealt with each of these problems in its stronghold; starting from the disturbance or the disease itself, he concentrated upon it and ultimately and in each case himself brilliantly won the remedy. Jenner similarly dealt with small-pox, seizing during his clinical experience of the disease upon folklore, from which he worked on and subdued a scourge; in like fashion and starting from compound fractures Lister attacked and swept away the sepsis of surgery. It is not often that the efforts of one man can achieve so much;

but the same form of successful attack can be illustrated by the work of Ross upon malaria, of Mackenzie upon auricular fibrillation, and by the recent work of Laidlaw and his colleagues upon the distemper of dogs. A more involved illustration is that of the discovery of insulin and its effect in diabetes melitus. First comes the recognition of the disease, then recondite laboratory research happens upon a new effect of excision of the pancreas, both essential steps; but the present aptness of the illustration lies in its final stages. Banting, a young doctor familiar with the malady diabetes, was inspired by learning from a clinical paper that obstruction of the duct of the pancreas leads to atrophy of the excretory parts of the gland; out of this idea he directly devised the method that first proved the presence of an internal secretion, insulin, in the remainder of the gland, and from this Banting and his colleagues themselves drove on to the end-point, the successful administration of insulin to patients.

These illustrations, by showing how important to the result is concentrated attack upon a problem in its own environment, place clinical science and the more recondite sciences in their true perspective. I pass on to consider some ways in which clinical science works.

Scientific discovery begins with observation, and it will clearly be perceived that discovery relating to disease forms no exception, but will always start from observations upon the disease. On previous occasions I have emphasized the importance of new descriptions of states of disease, and the associated attempts to define them precisely, knowing how vital is this branch of our work to progressive study of disease. Those who come into intimate contact with clinical researches are soon forced to recognize the profound influence of terms on progress, and the value of their accuracy. When we name disease, we invent terms which we realize to be abstractions. They represent abstract conceptions in precisely the same sense as do the terms atom, cell, vitamin; and as terms they serve exactly similar purposes.

A physiologist begins an analysis, he isolates what he terms carbohydrate, fat, protein; he attempts to study the origin, nature, and destination of things for which these terms are supposed to stand, and, as he studies, new qualities are found, he subdivides, and new names and new definitions spring up. So with our named diseases; we set out to isolate and to bring sharpness to our image of states of disease and begin to inquire what they are and whence they come. The names of diseases are not immutable. As with the physiologist, so with us, our terms change and our definitions shift as we work; such changes are inevitable, and constitute the adjustments, nay a measure, of progress. Our terms stand to us for conceptions which may be relatively vague or relatively precise, but which serve for intercommunication, and are numbered, like working hypotheses, among indispensable tools. Our definitions are beams of thought focusing in terms, and this focusing and sharpening of focus represents a high form of intellectual endeavour. But these mental activities, conveniently summarized in terms and in definitions, depend upon the close and endless work of observation and experiment, upon inquiries into the manifestations of disease and into its origin and natural history. This kind of work is little understood outside the ranks of actual workers in this field. There are the early attempts to isolate and separate states of disease in patients upon the simple basis of observation in the living. The resulting subdivision is crude, and constitutes no more than a beginning. There follow the more intense refining processes; hypothetically separate states of disease are closely scrutinized, underlying morbid lesions are examined, the various manifestations of the disease are subjected to

analysis, the cause of the disease is explored, and found perhaps in a change of environment or in the introduction or growth of organisms within the body. In these studies especially, knowledge and method derived from the allied sciences are used, in these studies the observational method begins to be found inadequate and the experimental method comes into play. The studies are intricate and often highly technical, and, as they proceed and the nature of the malady and its natural history are explored, ideas alter, and we begin to define and to rename. Thus, while the early names base themselves on simple observation, the later names and definitions base themselves on far more elaborate and difficult studies. The simple process of observation, from the nature of the case, soon tends to exhaust itself, but the accurate defining of states of disease does not. Here is an ever present opportunity of clinical science. The defining of states of disease, as it has been outlined, is fundamental to and inextricably interwoven with the study of these diseases; I affirm that this defining is yet in its infancy, that its primitive state is inhibiting the progress of medical science, but that as this branch of knowledge develops, our conceptions of states of disease will change profoundly.

There is more to be said about experiment; for in this direction our point of view in studying disease has begun to alter rapidly in recent years. It should be manifest that whenever we interfere with a patient, as when we employ any test of a patient's reaction to something introduced from without, to exercise, to a foodstuff or to any other substance, or to any physical stimulus, we experiment. Experiment has long been applied in the sphere of treatment. Every remedy employed to-day is the result of experimentation on man, every new remedy we shall employ in the future must inevitably pass through this experimental stage. The method has made three incomparable gifts to medical science and the welfare of mankind—namely, vaccination, antiseptic surgery, and general anaesthesia. Experiments judiciously selected and properly conducted are not only harmless, they are often or usually beneficial, teaching us more rationally to regard and manage the patient's condition. Those who have charge of patients are in this respect loaded with a grave responsibility; only harmless or beneficial experiments are justifiable. It must be understood that responsibility cannot be evaded by refusal to experiment; experiments always have been conducted, always will be, for they are essential to progress. It is obviously very important that such experiments as are made should be made with the consent of the patients, should be made in a safe manner, and that they should be conducted so that they give reliable answers to the questions asked. Of experiment in medicine, and especially in the examination of remedies, much that is done lacks precision and proper control; consequently, much of the work is valueless and must be repeated, and so very many more experiments are carried out than is necessary to determine the results. You will apprehend that, in so far as remedies are concerned, I am advocating a reduction in the numbers of experiments performed, and their conduction upon a stricter, safer, and more productive basis than hitherto. But the fruitful application of the experimental method to states of disease does not end with an investigation of remedies. There are many opportunities of testing patients by harmless interferences in such ways as to explain manifestations and causes of disease. In this direction the experimental method has only begun to bring us new knowledge. That is so because, apart from the search for remedies, more purely observational methods are traditionally natural to practitioners of medicine and surgery. The experimental method requires for its employment a special outlook and training; thus, those having easy access to patients use

this method and its controls little; and those trained to employ it are often denied the access, which they desire. Those working in other fields are able to recognize directions in which the method has already achieved success; but only those intimately in contact with the work of clinical science perceive the manifold directions in which it remains to be applied. I will not weary you by enumerating past results, or by pointing out specific problems now requiring this method of study, but will state categorically that it is peculiarly appropriate to innumerable manifestations of disease, and to many problems of causation. This statement is true not simply of one or two types of disease, but of problems connected with almost every variety of disease; the method is of almost boundless application. Experiences of work in diverse directions convince me that experiment is as fundamental in investigating disease in patients as it is in the case of other biological sciences, and that clinical science properly established would soon demonstrate the fact abundantly.

This general survey of the particular activities of clinical science, activities which have been considered previously on more than one occasion, will suffice to show that this science deserves very full encouragement. Briefly, the starting-point of the practical problems of medicine is the patient; it is clinical work alone which can formulate the problem, and it is the clinician who is best placed to guide it to a fitting termination; but this directing of work requires wide knowledge and often intimate experience not only of clinical methods, but of the methods and facilities afforded by allied sciences. The experimental method, which I foresee must play an increasing part in future work, calls for a particular point of view acquired by long training and experience in suitable original work. The employment of intricate apparatus and intimate knowledge of tests of precision make deep inroads into reserves of energy and time. While we may still expect to see many valuable discoveries coming from men engaged in the practice of medicine and surgery, it is increasingly clear that in many directions advances would more readily come from men free to give their undivided energies and thoughts to the work of progress, to the exclusion of routine. It is for this reason that the establishment of posts of clinical research has seemed so necessary. Because men must be trained to do such work, because it is right that those professing such work should enjoy the stimulus derived from teaching and from an appropriate atmosphere, it is necessary for clinical science to become established within the walls of the university.

III.

To discuss the important matter of educating medical students is not the object of this lecture; but in ascertaining the place of clinical science within the university this problem necessarily comes under review. It will be common ground, whether knowledge to be conveyed refers to practical art or to science, that education is most vigorously conducted by close contact between the student and the master of his subject; methods of work are learned from demonstration, methods of thought by conversation; communion inspires. If you would learn to do a thing, you go to one who does it well; you watch, you listen, and your own first attempts are made under supervision. The teaching of medical practice began and has continued until recent times under such a simple system of apprenticeship. The final stage of medical education in this country still rests solidly upon this traditional foundation, centring upon clinical demonstrations and upon a system of clerkships and dresserships; the high value of this method has obtained wide recogni-

tion. The most fitted to teach practical medicine and surgery are those successfully and daily engaged in its practice. But in a simple apprenticeship system, where a doctor has but one or more pupils, the standard of teaching would vary too greatly and would be in the average too low; therefore students are brought together under teachers chosen for their unusual energy and ability. While it is obvious that the best teacher for general practice is a first-rate general practitioner, such practitioners could rarely engage actively in teaching numbers of students and yet pursue their ordinary work. For the reason that among able doctors hospital physicians and surgeons are the most readily available, teaching has fallen into their hands. This has formed for many years a more or less satisfactory compromise, though one that becomes less so in the measure that consulting work grows more specialistic in its outlook. The main principle emerging is that the final stages in the preparation for practice should be conducted by practising physicians and surgeons. Efficient medical practitioners are not scientists; the bulk of their daily work is not to create or to discover, but to follow the established rules of an art; as in the case of other practical arts their work, while highly skilled and often ingenious, is nevertheless chiefly repetitive. Preliminary education in science I shall allude to later, for the moment it is the immediate preparation for practice that concerns us; of this I would say, that as it is an art, it should be taught by those who practise it; and we may be content that while such a system is basically sound, it happens also to be the most economical.

Enough has been said to enable me to bring the final stages of the education of the medical practitioner into proper perspective and to display more clearly my views of the main functions of the university in its relation to the final subject of the medical curriculum. In thinking of the education of the practitioner, one is forced to wonder if the final stages of his preparation for practice form an appropriate activity for the university. But this question of the extent to which it is proper for universities to prepare students along technical lines is one affecting so many other forms of vocational teaching that I shall not venture further to consider it. I shall assume for the purposes of present argument that universities will continue at least to direct vocational education. But if this assumption is a correct one it is necessary to come to two conclusions. On the one hand the university must be prepared to train, or to direct the training of, students in medicine as a practical art. On the other hand, it must take heed that this vocational training does not displace, does not prevent the full development of, the purely scientific pursuits of medicine within the university.

It would seem quite unsound from the university standpoint that the training of either practitioners or consultants should be regarded as a primary or direct function of a professor of medicine or of surgery. I do not mean that it may not be his function largely to control such training; I do mean that the transference of any of that work of training medical practitioners, which has been undertaken so well in the past by practising physicians and surgeons, to the professor would be a fundamental mistake. This training is manifestly the work of practitioners; it is very definitely not the work of professors in the full university sense.

The man who is fit to train the practitioner to begin his life work must be thoroughly familiar with everything that makes for successful practice, must himself be in practice, must not only understand disease and its management in its detail, but must be competent in managing sick people and their friends; he must be familiar with the science, skilful and precise in the craft, and versatile and diplomatic in the art. But these varied accomplishments

will not fit him for the professorial chair. The work of the professor as I view it, though from many points of view intimately related, is distinct from this. I ask the questions: Is medicine in its final aspects to be studied only by those engaged actively in its practice; is there to be no study of general concepts and of method, such as would be in more obvious accord with the recognized standard of university departments of science? Are we to remain content that activities of the latter kind should be pursued within the walls of the university solely in the departments of anatomy, physiology, and pathology? To answer these questions affirmatively is to deny medicine real university status; to answer them negatively is to accord that status.

To make clear what I have in mind I will attempt broadly to sketch professorial duties. The first duty of a university professor is the advancement of knowledge of his subject by research; his second duty is to encourage and to disseminate learning. These are the accepted duties of professors in scientific departments in all universities worthy of the name; there is no reason to view differently the duties of those who profess the science now under discussion. The professor should be chosen primarily for his distinction in his science, or for his promise of such distinction. I see no reason why distinction as a practising doctor should be regarded as a qualification, but reasons against. There is no reason why the professor should not be appointed, as often are his colleagues in other scientific departments, as a young man. He should have been engaged actively in research in an appropriate field—namely, work that is actually undertaken upon patients, or laboratory work that is directly related to, and inspired by, problems arising in the ward or outpatient department. Such work he should continue, and he should supplement it by personally directing the similar activities of his pupils. His own research work will probably develop, as prolific work nearly always does, along special lines, but a broad outlook will be maintained by his contacts with the work of colleagues and assistants, and by his teaching.

His teaching should have breadth, and in its outlines should be accessible to all. I have already indicated strong dissent from the idea that it should be concerned primarily with the needs of practice. It should deal chiefly with the principles of the science, and with patients only to exemplify specific points.

The professor should study and expound the history of the medical sciences, and especially of clinical science, and this should be done, not from the biographical standpoint, but with the definite motive of determining the ways in which problems are solved. His business is not with the eccentricities of medieval quacks, but with the origins and development of ideas in the minds of chief contributors to medical knowledge; and here, because true and full information is more readily available, his search should relate mainly to recent rather than to remote discoveries. He will trace the growth of knowledge, and will examine the influences of those systems or schools of thought which have prevailed. All this he will do in the attempt to discover sources of knowledge, prolific and sound methods of work.

He should deal with the problem of the cause of disease, or the conditions engendering disease, in its very many aspects; his survey will cover very wide fields; he will discuss the principles of hereditary transmission as these are known to relate to human disease, and he will inquire into the broad questions of the reaction of man to his environment; thus he will discuss on general lines such problems as the meaning and effects of infection, the significance of sexual, racial, and other predispositions to disease, and the influence of one state of ill-health upon another, the reaction of human tissues

to physical injuries and to simple chemical poisons, the meaning of curious susceptibilities to more complex poisons, and the manner in which new growths arise in man.

He will attempt to analyse outstanding manifestations of disease, such objective phenomena as arise out of altered metabolism, changed temperature regulation, and water balance, and such subjective phenomena as pain, breathlessness, exhaustion, and the like. I have in mind the consideration of these and similar manifestations both upon broad lines and in detail, but always with special reference to human disease. There are innumerable matters of this kind for profitable discussion and work; they should not be relegated to the pathological laboratory or theatre, for this procedure breaks contact with the human material, which can be used so aptly to illustrate, which inspires related laboratory problems, and itself so often constitutes the most prolific focus of inquiry.

In regard to diagnosis, prognosis, and treatment let these be dealt with again on general lines, by the laying down of guiding principles, rather than by the systematic consideration of specific diseases. It would be well to ensure first of all that what is meant by diagnosis should be understood and to contrast it with new descriptions of states of diseases; to explore error in diagnosis and its practical significance, and to emphasize the need for its complete avoidance in research that depends on diagnosis; and to compare the empirical method of diagnosis with that based on understanding. It would be well to show the proper basis upon which prognosis is built up, and to discuss the relative values of theoretical and empirical methods of procedure. It would be well to explore the ways in which new remedies are discovered; to show how the curative properties of remedies or their power to alleviate are to be ascertained; and to teach how, by research, the use of known remedies may be rationalized, the remedies perfected, and the field of their efficacy widened.

In all these directions the professor should strive to formulate and inculcate the principles underlying methods of work and thought in his science; he should insist upon the constant need of accuracy in observation, and of controlled experiment; he should teach the student to appreciate the value of evidence, and encourage logical forms of argument and of sequential reasoning. He should stimulate inquiry. He should display the details of his own researches and those of others, and illustrate discovery and the principles laid down, by repeating chosen observations and experiments in the form of demonstrations.

There is no branch of medical science that offers more opportunity for demonstrations, there is none which offers more occasion for the use of reasoned argument, there is none which calls for higher intellectual attainment; for there is none which combines so many forms of scientific activity, and none in which the worker is forced so closely and so frequently to consider both simple and complex problems of cause and effect. It is in his physiological studies that the medical student is first called upon to stretch those intellectual faculties which are particularly used by scientists; for this reason physiology is rightly recognized to possess great value as a mental discipline. But this beginning does not suffice. These faculties should be stretched farther and kept under tension. Not only has clinical science the fullest competence to effect this development, but, so far as medical men are concerned, it is manifestly the most appropriate branch of science in which to bring these mental faculties to their highest efficiency; for it is the branch of science with which medical men will remain in closest contact, or that in which they will actually engage, not for a few years, but for the rest of their lives.

It is not for me to present you with a syllabus, but it has been incumbent upon me to show that there is ample scope in the shape of research, lectures, and demonstrations within the field of clinical science, for professorial endeavour, apart altogether from a systematic consideration of the diagnosis and treatment of diseases. These activities, supplemented by the work of guiding others and efforts to maintain firm links with the allied sciences, are enough, and with well-defined facilities can be brought to successful accomplishment.

The first requirement of a university department of clinical science is an out-patient and in-patient service sufficient to provide ample material both for the research and the teaching in the department. There is room for difference of opinion as to how large such departments should be, especially as to how many beds are necessary; this will decide itself partly by the local conditions and by the particular activities of the professor and his assistants. The first point I would make is that the cases upon which work is being done should be under the full control of the worker; experience has shown that this policy is alone practicable. Productive clinical research usually comes from an intense study of carefully selected cases, rather than from less careful studies of larger numbers; certainly this is so in all but the preliminary stages of investigation; that is to say, once the problem has become defined. Consequently, though large numbers of beds under the control of the worker are not required, the professor and each of his research staff must have an adequate complement. I regard the ideal arrangement as one in which the worker, while fully controlling, and having full responsibility for, all cases under investigation, is further provided with a service of patients from which he can select, and that he should be relieved from responsibility in the management of these; such relief can be given in a number of ways, as by clinical assistants drawn from those concentrating upon practical medicine, or by the close linkage between professorial and other services. Some additional beds will be required to satisfy the needs of teaching; but the total number required is definitely less than ordinarily serves a teaching unit of practical medicine or surgery. Out-patient and in-patient service should balance; and the system adopted should be adjustable so that the professor or his assistant may be free to concentrate from time to time on cases in one or other service, or upon work on lower animals.

Adequate laboratory accommodation is a second requirement; here the need, in so far as space, fittings, and equipment are concerned, will be appropriate to the type of work, and will vary from time to time. It is important to the workers that these laboratories should be as close to the clinical services as possible; in part they may be directly attached to ward or out-patient department; sometimes it can be arranged that they will serve for the special and uninterrupted examination of either patient or animal.

IV

In considering the usual medical curriculum of to-day, and asking where in it clinical science is to play its part, I would start from the statement that this curriculum is already overloaded. So far as the majority of medical students is concerned it is overloaded by the preliminary sciences, including anatomy, physiology, and general pathology; so far as all students are concerned it is overloaded on the clinical side in directions presently to be indicated. My personal belief, founded upon over twenty years of constant teaching of medical students, is that most medical students derive less intellectually from their preliminary work than is often supposed. But I have also become convinced that while for the more scientifically minded student very full measures of physics,

chemistry, and physiology are invaluable, the final work of the hospitals, as now conducted, is far from satisfactory. It is unsafe for any man, whose training in science has started well, to accept, on an authoritative and not on an evidential basis, the mass of statement of fact and hypothesis that the final student is now called upon to accept. There is, too, the very grave objection that during several years out of those most important to a man's intellectual development he is occupied in amassing disconnected information to the exclusion of contemplation. It seems beyond reasonable denial that the full course of work, supplemented as this is by purely clinical appointments, if suited to the training of a practitioner, must be unsuited to the man who is to make science a career; it is wrong that he should so long be denied the chance of engaging in, or of being at least in close contact with, original work.

I think it is agreed that there are grave defects in medical education to-day, but agreement as to the remedy would come nearer if it were recognized that the right methods of educating practitioner and scientist are not the same. Cautious exploration may be necessary. But there is the principle to guide us—namely, a measure of separate consideration for two classes of student. I suggest as a basis of discussion the following plan in broad outline, and to simplify I shall omit considerations of those sciences which by consent form part of the basis of a general education.

There should be a first course consisting of outlines of human anatomy and physiology, both taught to ensure a clear understanding of the main mechanisms of the body and with special stress upon the needs of the final qualifying courses of instruction—that is to say, it should be particularly emphatic in teaching what is immediately applicable to the study of disease; for such matter will always command particular interest, and will be the more willingly and more easily remembered. It is not suggested that this course should consist exclusively of such material, for much must also be taught solely to illustrate the principles of the sciences concerned and their methods of work.

The second course should be one of more advanced physiology, suited to a science degree and to those who intend to take up physiology, pathology, or clinical science as a career. It should not be compulsory for medical students; it would ordinarily be taken in direct sequence to the first course, in some cases it would culminate in an honours degree, in some instances it might be delayed.

The third course should be the final or qualifying course, and it should consist on the one hand of general and practical instruction along present lines. For the qualifying examination it is necessary to demand a general standard of professional knowledge fitting the graduate to begin independent management of patients; but present-day teaching must be simplified in all its branches. What is essential to general practice should be retained and emphasized, but there should be ruthless pruning away of what is insecure, intricate, or redundant, and of what belongs peculiarly to the province of specialism. Teaching should mainly concern itself with common maladies and with remedies of proved worth and ready application. There should be a determined effort to arrange facts and ideas in thoughtful sequence, and to train students to think logically as well as to observe keenly. This simplified final course should include the outlines of clinical science, and, thus arranged, should be the regular course for all medical students. Higher examinations should, I think, definitely differentiate between two classes of students. The Royal Colleges and perhaps the universities would still hold advanced examinations primarily testing professional abilities. But there is room for a university degree in medical science,

which should not include medicine, surgery, or other branch of medical practice as such, but should centre upon disease, as this is studied in human beings; and this degree should be intended to mark those contemplating an academic career.

It is my conclusion that it is largely within the power of our universities to establish the branch of work that studies disease in living people as a science, by removing the obligation to engage in and teach the practical art, and by treating clinical science on precisely the same basis as the allied sciences, physiology and pathology, are treated, thus bringing all the work into real harmony. The maintenance of equilibrium among these three may then be left with confidence to the interplay of individual and general needs, and to the mutual sympathy that is natural in any corporation of enlightened people working to a common end.

LOCAL ANAESTHESIA IN GYNAECOLOGY

BY

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LONDON

The employment of local anaesthesia for gynaecological operations has never, in this country, attained to anything like the popularity it enjoys in so many Continental and American clinics. Various explanations have been suggested for this contrast, the most likely being differences in the general standard of inhalation anaesthesia, and the extreme sensitiveness of Englishwomen to any form of genital exposure. But whatever the reasons, the fact is established, and tends to discredit a method enjoying certain advantages which cannot be ignored. In order to appreciate these advantages it will be useful, as a preliminary, to notice the defects inherent in the other types of anaesthesia generally employed.

Disadvantages of the Non-local Anaesthetics

Inhalation Anaesthesia.—It should be remembered that in spite of the modern use of "safe" anaesthetics like ether and nitrous oxide, and of the increasing number of professional anaesthetists, a definite mortality must still be ascribed to inhalation anaesthesia alone. Greenhill¹ found that ether was the cause of death in 0.15 per cent. of 10,325 abdominal operations, while Bartlett and Simmons² state that 12.3 per cent. of the 148 deaths following gynaecological operations investigated by them arose from the same cause. In addition, certain post-operative, though non-fatal, complications may ensue. Bronchitis, pneumonia, and toxic hepatic changes are not uncommon, while acidosis and dehydration shock may result from prolonged administration. Lastly, the painful retching and vomiting which so often accompany returning consciousness remain one of the most distressing sequels of this form of anaesthesia.

Spinal Anaesthesia.—The substitution of spinal for inhalation anaesthesia was primarily designed to eliminate most of the disadvantages of the latter, but increasing experience has been disappointing in this respect. Its dangers and difficulties may be summarized as follows. (1) It is actually less safe than inhalation anaesthesia. In a large series of cases investigated by Bortone³ there was one death for every 311 spinal as compared with one for every 1,628 general anaesthetics. Babcock⁴ found seventy-five deaths in 215,000 spinal anaesthetics, and Rapaport⁵ seven in 500. Cooke⁶ and Bower⁷ both state that there are more deaths in proportion from spinal than from general anaesthesia, while Meeker,⁸ whose experience com-