

AN ADDRESS
ON
THE RELATION OF SCIENCE TO EXPERIENCE
IN MEDICINE.

Delivered at the Middlesex Hospital.

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IF a comparison be made of the two great branches of medical practice—surgical and medical—with reference to their present position and past progress, one of the most striking points of difference is that in that progress the influence of scientific discovery has been much greater in surgery than in medicine, so that those surgeons who speak of their own as the scientific branch of the profession appear to have some justification for doing so. It is generally known, even outside of the profession, that the surgeon has during the last two or three decades acquired new powers for the preservation of life and relief of suffering. Nor does anyone doubt that knowledge which has been acquired by research as to the nature and causes of traumatic infection has not only made the ordinary operations of surgery more successful, but has enabled the surgeon to encounter without apprehension difficulties which before were rightly considered insuperable. Most medical men would also admit that scientific discoveries in another field—that relating to the localisation of function in the central nervous system—have enabled surgeons to relieve many sufferers whose cases were previously hopeless.

As regards medicine, the influence of scientific discovery in recent times has not been so obvious. Progress has been made, but in a different way and much more gradually. It has been rather in nosology than in pathology—rather in the study of the distinctive characteristics of diseases with a view to diagnosis and treatment than in the investigation or solution of the difficult pathological problems which underlie the manifestation of disease in internal organs. A chief reason for this may, I think, be found in the great extent and complicated nature of the ordinary clinical investigations which it is the life work of the physician to make, with an immediate view to diagnosis and treatment—investigations which are so engrossing that if he carries them out thoroughly and conscientiously he has no time left for any systematic inquiries excepting those that are directed to these ends.

In saying this I do not for a moment suggest that it could be or ought to be otherwise. It would be an exaggeration to say that to be an accomplished clinician a man must be nothing else, for some of the greatest clinicians have been equally great pathologists; as a distinguished example of this we cannot fail to think of one whose name is revered by us all. On the other hand, it is undeniable that some of the greatest pathologists of the last half century have not been clinicians. To acquire clinical experience for oneself, to assimilate the experience of others, and to unite the items of the two kinds of experience so gained into a whole, so as to be able to bring them to bear at any moment on the elucidation of cases, is sufficient life-work for any man. It may be stated generally that the modern progress of knowledge in medicine has been due to the accumulation and systematisation of clinical experience; but this is only true so long as we assume that knowledge is of one kind only. I wish this evening to emphasise what you will all admit to be true—namely, that there is another way of regarding disease—as a subject of scientific investigation.

In other words, there are two kinds of knowledge, of which both are founded on observation, but the one is built up of data derived from the observation of cases during life and after death (for the clinician does not change his method when he enters the *post-mortem* room), that is to say, on experience; the other is attained by the method which in modern times has been called scientific because in the exact physical sciences and in the sciences of observation—such as physiology and pathology—which are immediately based upon

them, it is the only method used. Fully recognising the value of each, we correctly indicate their essential nature by designating the one empirical and the other etiological. But for our purposes the words “clinical” and “pathological” are more expressive, as denoting that the data which the one deals with are those of clinical experience, while the other seeks to discover the origin of diseases, that is, the antecedent conditions which produce them.

In emphasising this distinction, I feel as if I were labouring to enforce what everyone is prepared to accept. Few would be inclined to deny that the phenomena of disease may be legitimately brought within the scope of scientific investigation. I cannot, however, conceal from myself that there are very many persons whose opinions are well worthy of respect, to whose minds disease presents itself under one aspect only, namely, as a thing to be cured or prevented, and to whom any method of investigation which, disregarding for the moment the benefit of the sufferer, professed to have as its aim the discovery of the causal relations between certain morbid changes and the conditions which give rise to them, would seem unprofitable and even unjustifiable. Yet investigation of this kind is precisely what is meant by the scientific study of disease. We cannot apply this term with any regard for accuracy either to the observation of pathological changes after death for the verification of diagnosis, or to the use in the ward or laboratory of exact methods borrowed from other sciences for a similar purpose, but only to the direct investigation of pathological problems. The physician is constantly receiving aid in his special work from the more exact sciences, but this does not aid him in the investigation of the nature and causes of pathological phenomena. For the one thing needful is that the investigator should be conversant with the method by which alone a real understanding of the processes of Nature can be acquired—that method which makes all sciences one, uniting pathology with physiology and physiology with natural philosophy, at the same time that it draws a well-defined line of demarcation between science and what is not science.

If in what has preceded I have made it clear that medical knowledge taken as a whole presents itself to us under two aspects corresponding to the methods by which and the purposes for which it is acquired, I may now pass on to consider how important it is for the future of medicine that we should assign its true value to each of these two aspects of medical knowledge, the practical and the scientific, of which the first may be considered as the source of efficiency in the art of healing, the kind of knowledge which makes the physician supreme in the hospital and the sick room, the second as having in it the promise of the future. It is of the nature and certainty of this promise that I wish most to speak this evening. I hope you will not think it superfluous if before attempting to do so I say a word or two by way of retrospect.

I will not waste words in proving what is familiar to everyone who knows anything of the history of medicine during the nineteenth century, namely, that up to the present moment the advance of medical knowledge has consisted chiefly in the improvement of diagnosis—that is, in the discovery and employment in practice of exact modes of observing and recording cases. In the early days of medicine the criteria by which the physician was able to conjecture what ailed his patient were vague and his judgment thereon inconclusive. This is now no longer true. Just as in natural history the knowledge of plants and animals began with the recognition and discrimination of species, so the great achievement of modern medicine has been the accurate recognition of the various forms of disease. We should have no difficulty in obtaining striking evidence of this, if it were possible to compare our present clinical knowledge of any group of diseases of internal organs with that which existed before the middle of the century. I mention that time because it was the beginning of a period of rapid advance, the causes of which can be very easily traced. Of these the most important were the systematic study of descriptive pathological anatomy, the discovery by Laënnec of the methods of physical diagnosis, and the introduction by Louis of more exact methods of recording and observing cases. And here I would ask you to note that the experience on which the splendid edifice of exact knowledge which we now speak of as clinical medicine, is founded is as truly experience as that

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which Hippocrates, in his first and most familiar aphorism, so justly pronounced to be fallacious; for then no less than now, whatever knowledge existed was derived from the observation of cases, the difference being that the observations themselves were vague and the description of symptoms vitiated by the preconceptions of the observer. So that although the two kinds of experience might be as different from one another as a Greek galley and a modern battleship, Hippocrates was just as much a clinician as any physician of the present day; and we, on the other hand, are as truly empirics as he was. If we shirk the word it is not that we hesitate to admit that the knowledge we most value is that which is founded on experience, but because, like many other words, it has acquired a disagreeable meaning, which does not properly belong to it.

I have referred to the Father of Medicine as a clinical observer merely for the purpose of emphasising by contrast the statement that when we speak of the clinical method as that by which medicine has chiefly advanced to its present position, we use the expression in the most modern and comprehensive sense. The clinical method includes everything that we do for the elucidation of the case, whether in the ward, the *post-mortem* room, or the laboratory. However elaborate may be the instruments of precision which we may be able to borrow from the physiologist, the physicist, or the chemist for the examination of the patient during life or for the study after death of the changes which the affected tissues have undergone, our method is, and continues to be, clinical. Just as the art of destroying life does not become a science, notwithstanding that the complicated engines of destruction which are used in it have been constructed on scientific principles, so the art of saving life is not made into a science by the use of what are called scientific instruments. In a certain sense science is the handmaid of medicine, but this expression denotes only the technical relation between science and medicine. Thus, for example, when Helmholtz discovered the ophthalmoscope, new powers of exploration were thereby conferred on the ophthalmologist. In like manner we are grateful to the distinguished discoverer of *x* rays, not because we anticipate that they may serve to throw light on any pathological problem, but because the new mode of exploration constitutes so valuable an addition to the available means of exploration. But neither of these discoveries constitutes in itself an advance in the science of medicine.

I trust that you will not think that I have been needlessly wasting time in setting forth what in substance is sufficiently plain. I was desirous that we should have in our minds a just conception of the present position of medicine as affording the best standpoint from which to look forward to the future. I wished to make it clear that medicine has hitherto progressed chiefly by the perfecting of its clinical method, in order that I might express to you my own confidence that the future will not be merely a continuation of the past. The work of elaborating and co-ordinating case knowledge will, we may be sure, go on as it has done, and conduce as ever to an improvement of diagnosis and treatment; but, if I am not misled, we must look in another direction for the promise of the future.

I figure to myself the advance of medicine as taking place by two continuous processes or by two collateral channels, distinguished from each other by the tendencies which I have already indicated, but not severed from each other by any sharply-defined line of demarcation. Of the two the empirical or clinical has hitherto been the most important; but already the smaller stream—that which represents the scientific study of disease as a natural process—the object of which was marked perhaps more distinctly than in any other way by the publication of the first number of *Virchow's Archiv* just fifty years ago—is becoming year by year deeper and wider.

The systematic investigation of morbid processes is going on all over the world, and producing additions to knowledge which year by year increase in value and importance. Are we not right in anticipating that during the next century this progress will not only continue, but continue at an ever-increasing rate? I have not myself the slightest doubt that it will be so, and that in this progress even more than in the improvement of clinical methods the promise of the future is

contained. The line, therefore, we ought to pursue is clear. We have to make every possible effort to further the fulfilment of that promise. And it is well that we should recognise from the first that in this effort we must not expect to receive much encouragement from outside, not even from all of our professional brethren, whose practical tendencies and occupations make it difficult to realise any form of truth that does not fall within the scope of their own experience. This is the true source of the scepticism which we meet with every day as to the value of scientific investigation in medicine. The only way in which we can hope to cope with it is by knowing ourselves what we have in view, and how serious is the task we have undertaken.

There can be no doubt that this task is beset with difficulties, but, on the other hand, I think that there are good reasons for the hopefulness which I have allowed myself to express. No one here need be told that the facilities which are afforded here in this and other London schools for pathological study contrast in the most striking way with the state of things which existed when I was a member of the staff of this hospital. But external conditions in the way of laboratories and their equipments are not the one thing needful for work. As in practical matters, so in research, the worker is much more essential than the workshop. Now the contrast between now and formerly in our London schools and elsewhere is even greater as regards the number and competency of workers than as regards the means for effectual work at their disposal. The two principal qualifications for our work are, in my judgment, training and faith.

To be of real value as an investigator a man must have learned, by becoming conversant with some field of exact scientific inquiry (the most important and best adapted for the purpose being chemistry and physiology), the nature and value of the scientific method, and have thereby acquired confidence in its power to unravel all questions which fall within its own categories. Such a man, when at last having bid adieu to examinations and (will you allow me to add?) resisted their deadening influence, he is again able to think freely, is prepared at once to come to the front and take his part in the investigation of pathological or etiological problems. So far as concerns British pathology, the fact that affords us the strongest ground for confidence as regards the future is that while thirty years ago you could with difficulty find anyone possessing the qualities for genuine scientific work, such men are now forthcoming in every hospital.

I trust that these considerations may serve as a basis for the discussion of certain suggestions of a practical nature which I desire to bring before you relating to the part which we may hope that the London school of medicine will take in the future advancement of medical science. We may, I think, rightly regard the metropolitan schools collectively as constituting in themselves a great medical university. We do so in the hope that at no distant period they may be united for university purposes. Now, the two great functions of a university are education and the extension of knowledge by research. As regards the first I shall have nothing to say this evening. We may confidently anticipate that the clinical instruction given and the opportunity for clinical study afforded to students will improve year after year, and that practitioners will twenty years hence be even better informed, and their practice more sound than it is at present. But it is the other function of a university to which I would call your attention. Admitting, as I think must be admitted, that the metropolitan schools have been hitherto, and will continue to be, admirable institutions for the training of men competent to exercise the healing art to the public advantage, it may still be asked whether our hospitals are, as they ought to be, observatories in which the scientific method is employed, not with a view to immediate utility, but for the eventual benefit of mankind by the advancement of knowledge. If we are right—as I am sure no one present doubts—in regarding a hospital school as an academical institution of which it is as much the function to make additions to knowledge as to educate, the organisation of every hospital school should comprise a special department for research in medicine—that is, that just as we have recognised for long the importance of pathological anatomy by the establishment in each school of a museum for the collection and display of morbid specimens, so we should provide what

is of much more importance to the progress of medicine—a working place for the investigation of morbid processes. And, inasmuch as in most instances such investigation could be carried out much more effectually by the co-operation of several hospitals, I should further desire to see established a Hospital Association or an Association of Hospitals for the advancement of medicine by research. The organisation of such an association would be simple. Each hospital would, as I have said, provide a research laboratory, under the direction of a working pathologist, the equipment of which would be the best that the resources obtainable for the purpose would admit of. The function of the Association would be the selection of subjects suitable for combined investigation.

Of the nature of these problems I need, I think, speak only very shortly. They would probably be of two kinds, namely, etiological and therapeutical, for it seems evident that for the investigation of the action of remedies, including under this term all the agencies which can be employed for the purpose of modifying pathological states, the same combination of clinical with physiological research is required as for the investigation of the processes of disease. But the greater part of the work of the Association would come under the other head. It would be advisable to restrict the scope of the investigation undertaken by well-defined limitations, and particularly to guard against the attractiveness of topics deriving their interest from their novelty or from the rarity of the diseases to which they relate rather than from their intrinsic importance. Preference would rather be given to the standing questions of clinical pathology, as, for example, to the investigation of the nature and causes of functional disorders or organic changes which, however frequently they may occur, are very imperfectly understood; and among these it might be well to select those in respect of which current medical opinion appears to be less in agreement than could be wished with the data of science. Let us take, for example, the case of gout. Here the difficulty which we find in harmonising what is ordinarily believed as to the etiological relation of gout with uric acid, with the relatively complete knowledge we now possess of the physiological significance of that substance, at once suggests that it is desirable that the two kinds of knowledge now apparently at variance should be, so to speak, confronted. Another field in which it is difficult to reconcile the clinical and physiological aspects of the same phenomena is that of the relation between chronic renal disease and the functional disorders of the vascular and lymphatic system to which it gives rise. Here, again, the light which has been thrown on these subjects by such experimental investigations as those of Dr. Starling (which I may mention in passing, have since their publication been confirmed by subsequent work in Germany) make us feel a certain degree of disappointment in finding ourselves still compelled to speak with the utmost reserve about such questions as the etiology of renal dropsy. Here, as in many other instances of a like nature, unsolved problems present themselves in connection with even the best-known diseases, from the moment that we turn our attention to the underlying processes of which the familiar clinical characteristics are but the outward and visible signs.

I trust that the suggestion I have made to you may not seem wholly unworthy of your attention, however imperfectly I may have been able to set it forth. I do not, myself, feel it to be premature. I should not, however, have the boldness to propose it even now, were it not that, as I have already told you, the reason which would have forbidden its being entertained no longer exists. We have now what we had not before—a sufficient number of men who, with youthful enthusiasm and with the best of their lives before them, have at the same time the scientific training necessary for pathological research.

If, as I trust may be the case, the new metropolitan University is successfully constituted, it may be hoped that the economy of resources consequent on a better organisation of scientific teaching may set free the hospital medical schools from obligations which at present seriously impair their efficiency as academical institutions. At present, as we all know, elementary chemistry, elementary natural philosophy, and natural history are taught in schools of medicine; and large sums have, no doubt unavoidably, been spent in providing accommodation for subjects which lie outside the legitimate

scope of medical study. It is surely not too much to hope that when these preparatory disciplines are duly provided for elsewhere, the resources hitherto required for their maintenance may be devoted to purposes in which we as the representatives of medical science can take a deeper interest, and particularly to the establishment in all hospital schools of well-equipped working places for clinico-pathological researches.¹

In all that I have said this evening my aim has been to advocate the claims of scientific research in medicine; I have made no reference to the teaching of science. It is, however, easy to see that if the organisation of pathological research were to become more distinctly recognised as a function of a hospital medical school, the tendency of the change would be to infuse into the teaching of the science of medicine a reality and life which it has not as yet possessed.

Under present conditions there is much too wide a gap between the scientific and the practical part of the course of study for medicine. Let me take, for example, the case with which I am most familiar—that of the Oxford or Cambridge student, who, after receiving his preliminary instruction in the exact sciences in biology, and then acquiring a more thorough knowledge of anatomy and physiology, repairs to a metropolitan medical school for the most essential part of his medical education. A considerable proportion of these comparatively well-trained students are able to grasp the connection between science and practice, so as to appreciate the bearing of the science they have learned with the practical work in which for the rest of their lives they are to be engaged. But as regards the rest, we know what happens as soon as they have got rid of their last examination in science. It would be of little consequence that the details of the knowledge which has been so painfully acquired should fade from the memory, if one could believe that some notion of the scientific way of looking at questions was retained.

Whatever plan of study is followed, it is inevitable that the competent should succeed and the incompetent fail; but in our medical course there are causes of failure which it seems possible to obviate. One of these is no doubt the overloading of our preparatory scientific curriculum with subjects which have no bearing on future work, an evil against which the General Medical Council has failed to protect us. The other is the unfortunate interruption of continuity which exists between the practical and the scientific stage in medical study.

It may, I think, be stated generally that every student when he enters on his hospital career feels that he is turning over a new leaf. It is quite natural that he should do so, and quite right, provided that he does not lose his interest in what he has previously learned. How is this to be prevented?

I have submitted to you this evening the proposition that research ought to be a recognised function of every medical school that lays claim to an academical position, on the ground that research is necessary for the advancement of medical science. The more this principle is acted upon the more effectually will the science of medicine be taught, for there is no qualification so essential to a teacher of science, and especially of pathology, as that he should himself be engaged in trying to master its difficulties.

Every advance in the direction I have indicated will have a direct effect on teaching. The breach will cease to exist. The physiologically-minded student will no longer feel that in approaching the bedside he must leave his scientific preconceptions behind. In turning over the new leaf he will not forget what was inscribed on the old, but will rather find that the old has acquired a new value from its intimate connection with the work of his life.

But, gentlemen, all depends on whether you accept the proposition I have submitted to you—namely, that the science of medicine, even more than the art, holds the promise of the future.

NOTE.

¹ At the Middlesex Hospital a systematic investigation of the pathology of cancer is now in contemplation. I learn that it is intended to appoint a highly-qualified young pathologist to conduct the proposed research, and that in the necessary clinical work he will have the co-operation of the registrar of the Cancer Department of the hospital. The whole will be under the direction of a Committee of the hospital staff. I refer to this as an example of the kind of work that can be done, and of the way of doing it.