What pathology - and pathology for what ?

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In this short consideration of some problems in medical education it is proposed to deal with what pathology the undergraduate requires and what pathology is needed in postgraduate study for specialization. This subject was chosen for two reasons. First, it appears timely since medical education in general is actively under review. Secondly, with the recent foundation of the College of Pathologists it seems likely that the pattern of education for pathologists will be formulated and generally recognized for the first time. Whatever decisions are taken are likely to influence the course of clinical pathology for the next 25 years. But before dealing with this great problem it might be of value and of interest to look at education in pathology in a more general way—indeed to consider its place in medical education.

PLACE OF PATHOLOGY IN MEDICAL SCHOOLS OF THE NINETEENTH CENTURY

At the present time it is difficult to imagine the medical course as it was when the medical schools were instituted. Certainly there was great variation in pattern and this was often largely determined by local circumstances. In general there were two main patterns of medical school in Europe in the nineteenth century. First, there was the university type which grew up in Germany, Holland, and the Scandinavian countries. Here the teachers in medicine and surgery were professors of the university who taught by giving formal lectures in a conventional way. In these universities they were in every way similar to professors of non-medical subjects and were of course employed whole time. They tended to be appointed on the strength of original contributions to their subject and so it happened that research was emphasized even at this early stage. With the development of hospitals which followed the professor became head of the university clinic to which were attached clinical and research laboratories. Many people believe that this form of organization was responsible for the great contributions made to medicine by the Germans in the last century. Certainly their research was facilitated by their access to laboratories in basic scientific subjects. In this connexion it is worth noting that in 1824

Purkinje had a physiological laboratory in Breslau; in 1825 Liebig had a chemical laboratory in Giessen, whilst in 1856 Virchow had his famous Institute of Pathology in Berlin. The purpose of these details is not so much to highlight the German system as to provide a striking contrast to the different methods employed in Britain. Here, medical teaching arose out of hospitals. The student attended the hospital and observed physicians and surgeons at work. It was essentially an education in the practice of medicine and really an apprenticeship, and at least gave the student instruction in the type of work in which he would be later engaged. The teachers were of course employed part-time as they were in private practice. It differed from the university system in being a clinical training in which little basic science education was included. Such anatomy and pathology as was taught was done by surgeons in the course of their clinical teaching. In the same way a little physiology was taught by other clinicians. Towards the end of the century, with the rapid growth of the basic sciences, it became clear that they could only be adequately taught by persons who devoted themselves entirely to these subjects. The status and standard of these teachers was not always high as the financial resources of the medical schools were limited. More important still was the fact that even though the basic subjects were emerging in their own right they were still very much the province of the clinicians and indeed in some schools continued to be so until the first two or three decades of the present century. Thus the training of students in pathology really remained for a long time largely in the hands of the clinicians. I think that this delayed the full recognition of pathology as a separate subject in Britain. It was not until about 1929 that pathology was introduced as a separate subject in the Final Examination of the Conjoint Board. Up to this time research had lagged behind. The part-time clinicians had little time and few facilities. For the students, the only stimulus came from questions arising out of the attempted correlation of symptoms and signs with the structural findings as revealed at necropsy. The vital part played by the basic sciences was missing, and any research that was done tended to be clinical rather than basic. Later, with the increasing recognition of the basic sciences links between the medical school

¹This is the slightly abbreviated Presidential address given to the Association of Clinical Pathologists on 1 October 1965.

and the local university were forged and eventually the heads of departments became professors of the university. There was thus a progression towards the university system as cited in the case of Germany, but there was never quite the same emphasis on research or on the basic sciences.

DEVELOPMENTS BETWEEN THE WORLD WARS AND AFTER

Up to the late 1920s the professor of pathology was invariably a morbid anatomist since structural pathology comprised the greater part of the subject. Consequently, the students' course was very heavily weighted in that subject though there was of course some bacteriology. Haematology and chemical pathology were scarcely touched upon and many students regarded pathology as a whole as a very lifeless subject the application of which could not be fathomed. There was no introductory course in pathology, students being sent to commence their clinical work on the wards immediately they had completed their examinations in anatomy, physiology, and pharmacology. In the period between the wars this situation was dealt with by the introduction of a course in general principles of pathology, given on completion of the second M.B. and before the commencement of clinical work. It lasted for three months and was instituted at the request of the clinical teachers who maintained that they could not teach basic medicine and surgery to students who knew no pathology. With the advent of the introductory course some teachers in pathology found it equally difficult to teach their subject to students who knew no medicine or surgery. The students regarded it as a rather frustrating period and were anxious to get to grips with clinical material and thus be 'real doctors'. When these same students returned a year later to do a course in special pathology the transformation was quite startling. They had obtained some clinical experience and were anxious to make up their deficiencies in pathology. In most medical schools in the country it is now the custom to give both clinical and pathological instruction in the preliminary course following completion of the second M.B. examination. The lesson to be learned is that clinical subjects and pathology must be taught together and in relation to one another in a course of general medical education. One is in fact making out a case for pathology as a clinical subject, though this may be thought unnecessary as in this country it has always been regarded as such. Nowadays there is a tendency to think of it as a basic science and American influence has done much to promote that view. In most of the main teaching centres in America it is the universal rule that the whole course in pathology, as taught by the department, is given

in the pre-clinical period. Difficulties must necessarily arise and the ways of dealing with them are of interest. In one university the teaching of pathology is supplemented by clinicopathological conferences run by the students themselves, none of whom have ever seen a patient, let alone know anything about clinical disease. This is most unrealistic but the fact that this method is widely used shows that it is practicable. It is only fair to say that although not in agreement with this system, it works better than one might expect. The saving grace is that there are many clinicopathological conferences during the clinical years which teach the student the application of the subject to clinical medicine. It is all very well to say that pathology is a basic science and to line it up with anatomy and physiology. But pathology is much more than that and in planning future education we must recognize that it is both a basic science and a clinical subject.

DEVisING NEW PATTERNS

At the present time it is universally agreed that medical education is unsatisfactory. This is well illustrated by the fact that there have been world conferences on medical education in 1953 and 1955, the formation in this country of the Association for the Study of Medical Education in 1958, and in July of 1965 the appointment of a Royal Commission on the subject. It is reassuring to see that one pathologist is a member of the Commission, though a broad subject such as pathology should surely have merited rather wider representation.

Broadly speaking the difficulties have arisen in two ways. First, the growth of medicine and surgery has been so rapid that specialization has been forced on the clinicians. Thus the teaching hospital has ceased to be a general hospital and it has become increasingly difficult to give a student a general clinical education. He has often gained experience in a few highly specialized branches to the complete exclusion of others. This is, of course, a problem for the clinicians rather than pathologists and they have to some degree overcome this difficulty by arranging for students to visit non-teaching hospitals which admit patients suffering from a wider range of disorders. Probably the greater difficulty, and one which concerns pathologists more, is the very rapid growth of pre-clinical basic science subjects. This part of the course has become grossly overcrowded. Attempts to reduce the amount have not really been successful because the specialists themselves are loathe to reduce their share of teaching time—some because of their enthusiasm for their subject, others because they fear a loss of prestige. The position has worsened with the realization that there are some basic sub-

jects, such as sociology and psychology, which are necessary for any student whose whole life may be occupied in dealings with human beings. It is obvious that a new approach is essential. Some clinicians have suggested that the pre-clinical subjects should be reduced by teaching only their applications to medicine, but this is unacceptable, because the pre-clinical sections should be educational and the clinical sections applied. On reflection there are certain things of paramount importance. First, the student entering medical school must learn how to teach himself: this is probably the greatest difficulty in the changeover from school where one is taught and university where one should be guided but yet able to teach oneself. Instruction in the use of libraries would be invaluable. The second important thing and maybe the more difficult is mind training. This would involve exercises in the use of a critical faculty, and the methods of reasoning, and some elementary logic would not be out of place. In the present attempts of educators to recast the pre-clinical course completely it has been suggested that a degree in human biology be instituted. A three-year course is to be introduced at the new medical school at Keele. This has recently been included in a report of the Steering Committee for the School of Medicine and Human Biology. Although the core of that course will be biology, applied mathematics and statistics will be included to emphasize the importance of quantitative methods in research and in clinical medicine. Less emphasis will be placed on structure, basic though it must always be, and the functional aspects stressed. In addition basic principles of psychology and sociology will be included. Although much of this is apart from the concern of pathologists it must be noted that a certain amount of pathology will be included. Many pathologists as they proceed in their career will have experienced a widening of their interest which takes them into the realms of animal pathology. This drift to comparative pathology and the concepts of the response of animals to abnormal genetic and environmental stimuli have drawn us nearer biology. This approach is merely an attempt to understand the underlying principles of pathology. It is in fact what it is hoped to achieve. In this proposal by the working party there is no attempt at teaching the application of pathology to medicine during the course in human biology. This must be done in the clinical years, and this is the fundamental difference between these proposals for the teaching of pathology and the present system which exists in America.

If this system becomes adopted the pre-clinical part of pathology will be educational and the clinical part of it applied. The pre-clinical tuition will be carried out by the department of pathology and the

amount of applied pathology taught by clinicians may vary from centre to centre. Pathologists must decide how the application of their subject should be taught, for it would be wrong to expect this to be done in the clinical departments.

UNDERGRADUATE TRAINING

From the practical point of view, if undergraduate education is unsatisfactory in what ways do we find the average graduate deficient? First, he has never acquired a knowledge of the general principles of the subject and it seems that whatever type of work he is destined to do this is of vital importance. This defect can be readily observed in postgraduate students. Secondly, although he has learned some structural pathology, he lacks a knowledge of the application of pathology to the clinical subjects. This gap is particularly noticeable in young residents in hospitals. They have little idea of how to use the laboratory tests at their disposal.

Many students feel that they have always been taught that it was vitally important to understand pathology in order to learn the clinical subjects. Everyone seemed to pay lip-service to pathology, yet when they came to do it they found it uninspiring: the histology got more and more mysterious, and they finally sank beneath a flood of round-cell infiltration which engulfed them from all sides. The chief complaint is that pathology did not appear to be a living subject. It would be neither possible nor desirable for all medical students to have an extensive course in clinical pathology to remedy this defect, for the subject with all its branches has become too vast. He could acquire such knowledge by having part of his special course in pathology devoted to the laboratory investigation of specific clinical problems. The increased use of clinico-pathological conferences would also assist in this approach. If this were done it would avoid the presentation of pathology as a series of specialized subdivisions of the main subject, *e.g.*, haematology or microbiology, and reveal the applications of it as a whole to clinical problems. It is in this respect that the clinical pathologist has so much to offer. Dr. Sidney Dyke, the founder of the A.C.P., says in the preface to his latest edition of 'Recent advances in clinical pathology': 'In the teaching hospital the Department of Clinical Pathology occupies a key position in the training of the medical student, to whom it offers conditions available in no other department to learn the application to medicine of its basic sciences. In the face of present developments it seems inevitable that the rational practice of medicine in the future must come to depend more and more upon the training received by the medical

student in clinical pathology and the extent to which this influence permeates the whole of his hospital.'

The student's deficiency in understanding the general principles of pathology should be remedied in a different way. After passing his second M.B. the student should have a very short course (not more than one month and possibly less) in pathology and in elementary clinical observations. He would learn the broad differences between an inflammation, a degeneration, and a neoplastic condition. Following a period of clinical experience his course in special pathology would follow. The greater part of histology should be omitted and emphasis laid on morbid anatomy related to clinical signs and symptoms. Clinical pathology would thus be taught by the methods of investigation of important signs and symptoms rather than as branches of pathology. By his final year the student would be in possession of a certain amount of special and applied pathology. This would be the time to draw together the fragments of his knowledge. During the final year a short revision course in the principles of pathology should be given. At this stage the average student could easily assimilate the principles and be ready to study pathology as a postgraduate student in its application to the special subject of his choice. According to current views the principles will be taught in the pre-clinical period. What chance of success will one have of teaching principles in the first or second year when students are now unable to grasp them in the third? How illogical to expect anyone to appreciate the principles of disease, a subject with which they have as yet had no contact? By all means give students an introduction to the principles of the subject at an early stage, but do not expect them to grasp them fully. The revision course in general principles is the real solution. This suggestion of teaching the principles of pathology at the end of the course is unlikely to be well-received by medical educators in general. It might be criticized as illogical to teach principles late in the course, but the fact remains that the present system has not proved satisfactory.

POSTGRADUATE TRAINING

We must now turn our attention to postgraduate pathology. At the present time the requirements are mostly in applied pathology for those specializing in medicine, obstetrics, and gynaecology and radiology. With surgeons, dentists, and anaesthetists it is different. About 20 years ago the Royal College of Surgeons first introduced pathology as a subject in its Primary Fellowship examination. The examination was in the principles of pathology. Applied pathology is asked in the final examination and forms a very limited part of it. Primary Fellowship

students show great enthusiasm for pathology. With their knowledge of special pathology and their clinical experience they are able to assimilate the principles very rapidly. Many say that it is the first time that they have ever been able to understand the subject at all. Others who have later proceeded to academic appointments have found this course of great help in their research activities. When this course in basic sciences was instituted it was thought by some that ultimately specialists would be required to take a common primary examination.

As an ideal this would have much to recommend it. However, in practice it is unlikely that it would work. It would hardly be reasonable to expect a psychiatrist to know the same amount of anatomical detail as a surgeon. Pathology does not present quite the same difficulty yet it is doubtful whether anyone would expect an anaesthetist to know the same amount of basic pathology as a physician. Indeed, at the present time the emphasis on pathology in the Primary examination for anaesthetists has already been reduced. During the past year or so the Primary Fellowship examination has been under review and it was even suggested that pathology be eliminated from it. This would, of course, be disastrous and a very retrograde step. If one felt that every graduate possessed a sound knowledge of the principles of pathology then it might be argued that it would be a waste of time repeating it. At present we are still far away from that possibility.

TRAINING OF PATHOLOGISTS

The training of pathologists and particularly clinical pathologists must now be considered. The development of a pathological service for non-teaching hospitals in this country has resulted in a great expansion of clinical pathology over the past 30 years. Even after the first world war the subject was still in an embryonic state. The founding of the Association by Dr. Sidney Dyke in 1927 was instrumental in the development and recognition of the subject and a small group of pathologists including Dr. Greenfield, Dr. Cuthbert Dukes, and Dr. V. C. McMenemey played a very important part in the earlier years. Yet it was a one-sided development for whilst the service to clinicians was greatly improved, and the status and working conditions of the clinical pathologist raised, there was really no recognized method of training. At that time the persons who obtained posts in clinical pathology in non-teaching hospitals were those who had little or no training in the subject or who trained in an academic department but had been unsuccessful in obtaining a permanent appointment. This fact, coupled with the

poor remuneration offered, made pathology an unattractive subject to many. Thus it happened that even in the 1930s the clinical pathologist simply had to do his best and many were largely self-taught. However, the young pathologist of those days obtained much help from the meetings of the Association and the laboratory meetings of the Section of Pathology of the Royal Society of Medicine. Since that time clinical pathology has grown to be almost unrecognizable but still the training side remains neglected. The average clinical pathologist as a practical worker in an applied field has left the teaching and training sides to his academic colleagues. Yet it is an astonishing fact that even in 1965, apart from the D.C.P. course at Hammersmith and also at St. Stephen's Hospital, London, under Dr. Signy, which caters for about 25 students per year from all over the world (apart from courses for Services personnel), the only other attempt at providing postgraduate courses for pathologists has been by the Association. This resulted from the foresight and energy of Dr. Cuthbert Dukes who just after the second world war instituted some short refresher courses in pathology for consultants who wished to brush up their knowledge in a special branch of the subject. In recent years they have broadened somewhat and their success has been due to the willingness of individual members to put their special material at the disposal of others. They entail a lot of work and the Association is indeed fortunate to have so many public-spirited members. In the early days the courses dealt with problems in histopathology, whereas now they include problems from all of the subdivisions of pathology. Furthermore they have been extended to registrars in training for whom a few special courses have been organized, and a secondment project has been launched by Dr. R. C. B. Pugh whereby pathologists can spend a more extended time in a laboratory learning specialized techniques. Yet even such progress as has been made falls short of an ideal, for the courses are in no sense complete or organized and there is as yet no systematic course which can be attended by pathologists in training. Pathologists in training from abroad frequently express surprise at this gap in our postgraduate educational programme.

This deficiency is of some concern for no hospital service can be really efficient without a first-class laboratory. The difficulty is to find a sufficiently large number of first-class pathologists for these posts, and these will not be forthcoming unless an adequate training programme exists. It seems fairly certain that the majority of pathologists now in training will probably end up in clinical laboratories where increasing demands on their skill are being made with the rapid advances in medicine and

surgery. This is a sufficiently strong argument for clinical pathologists to interest themselves more than they have previously done in postgraduate education. It might be useful to analyse briefly the steps that might be taken in an endeavour to raise the standard of clinical pathology. First of all good men and women must be obtained for training. Examinations with all their drawbacks will do much to eliminate the frailer types, but the problem begins much earlier than this. It is of the first importance that the initial step be taken in the undergraduate training period, and it is here that we badly need the co-operation and help of our academic colleagues. It must be admitted, though reluctantly, that pathology as it has been taught in the past has often failed to interest the students. The glamour of the clinical subjects and the drama of surgery and the operating theatre are lacking. Students training to be doctors are apt to regard the autopsy room (with which pathology is often identified) with distaste as a place in which the failures of the clinical side are revealed. It should of course be presented to them as the essential training ground for the application of the basic principles underlying medicine and surgery. Pathology should be presented as a living subject which is applicable, useful and essential to the patient. Many American universities have adopted a method of capturing the student's interest at an early stage by instituting 'elective periods'. For a period of three months he can elect to work in any department of his choice. The academic pathologists, feeling that the better students were often attracted to the clinical subjects, tried at an early stage to interest them in pathology by offering them facilities in the laboratory. It has proved most successful and has resulted in an increased recruitment of better students into pathology in America. This elective period can in some instances be carried out in the departments of other universities, or indeed other countries. It must be confessed that in many cases American professors were really trying to increase research potential in pathology. The advisability of this is questionable. It has been contested that students should be interested in research as early as possible because it is during the earlier years that original ideas are most likely to be produced. Yet students may become fascinated by research to such a degree that they have difficulty in returning to their basic studies, which then appear humdrum and rather pedestrian. If such a scheme could be widely encouraged in Britain, with the cooperation of our academic colleagues we should soon not be short of good recruits for specialization in pathology. It would not be advisable to encourage research during this elective period but essential that the vital and exciting part that pathology plays in everyday medicine and

surgery should be appreciated. The next problem is the way in which postgraduate training is to be provided for these recruits. This is more difficult, for it entails the recognition of suitable training centres as the small number of teaching centres cannot deal with the large numbers of trainees required. It is reassuring to know that the College of Pathologists is giving such serious consideration to this problem. The difficulty has, of course, been met to some extent by joint appointments where the trainee spends a part of his time in the teaching hospital and is then seconded to a routine laboratory of a non-teaching hospital. This scheme is excellent, for pathology is essentially a practical subject and thus one which can only be learned by practice. What is required of the trainee for a certificate of proficiency will be determined by the nature of the examination which he will be asked to pass. This point is of crucial importance with the introduction of the Membership Examination of the recently-founded College of Pathologists. At the best of times generalizations are hard to make and particularly so in this case. In modern times the would-be pathologist commences his training without in many cases any clear idea of where he will end up. There are so many possibilities. Amongst these there is clinical pathology which will probably claim a majority over all the others put together. It may be a symptom of advancing years that one would like to see all these people spend at least two years in obtaining some general knowledge, however superficial, in all the main branches of pathology. Many would not agree with this, though there is no doubt that the clinical pathologist should have this as part of his training. Apart from the fact that as broad a training as possible is desirable for a career in clinical pathology, the present organization of the laboratory service makes it imperative. By no means all hospitals have the luxury of a specialist in each of the four branches of the subject, and in many places two pathologists share the four branches. To one who in the past has worked in all four branches it seems wrong that there should be pathologists in a laboratory who have literally no knowledge of two of the subjects. The present regulations for the Primary Examination of the College might well result in the production of such pathologists. This would be wrong because every pathologist should be able to deal with an emergency in any branch and also because it would limit his ability to supervise technical staff. It would also cause difficulty in providing coverage for holiday periods. Finally, if one regards clinical pathology as the investigation of a problem in medicine or surgery the barriers between the branches of pathology break down. The tests required for investigation of a clinical case are rarely confined to one branch, and one pathologist should

be able to interpret the findings in most instances. With the rare special case obviously more than one specialist might be required.

These are some of the difficulties in making a general plan for a career in which there is so much scope for divergence. If everyone knew at the outset of his postgraduate training the exact type of career which he would follow then the problem would vanish. But this we all know is only rarely the case—few of us when we enter medicine have any real idea where we shall end up.

Having agreed that the important part of the training of a pathologist is to work in a laboratory are there any other ways in which we might further his training? In an era where the maxim seems to be 'have it done for you' rather than 'do it yourself' there is a demand for organized courses in preparation for the examination, and as yet none are available. Courses in laboratory work should not be provided except in regard to rather specialized and unusual techniques. The practical training should be obtained in the laboratory in which the trainee is working. There might be something to be said for a course of lectures in the general principles of pathology especially in view of the recent News Letter from the College of Pathologists in which the high failure rate in the general paper was pointed out. This emphasizes the point that has been made about a similar deficiency which exists in postgraduates who are training for specialization in surgery and anaesthetics, and therefore presumably all students. If any such course were instituted an evening lecture course available in various centres in the country would be ideal. It might at the present time be difficult to find the pathologists who would be prepared to give it. Some might wish to go further afield and make this a basic sciences course.

TECHNICAL TRAINING FOR CLINICAL PATHOLOGISTS

But there is yet another more important aspect of the initial training of the clinical pathologist. For many years it has been customary for clinical pathologists to be familiar with and competent in the technical procedures of the laboratory. In recent years, however, with the rise in standard of technical assistance this aspect has become less important for the pathologist. Indeed at the present time it is quite beyond one person's capacity to know all the technical procedures, though it would be wrong for the pathologist to abandon them altogether. How much is left to technicians varies with the branch in question, for chemical tests such as for blood sugars, ureas, etc., are essentially technical procedures. By contrast although the same may be said for tissue processing, the selection of material for histological

section should be done by the pathologist. It would certainly be difficult for him to criticize processing defects in the histological sections without any knowledge of the technical procedures. Most good pathologists learn it of their own free will. Apart from this the pathologist as a consultant on the same level as consultants in other branches must prove himself worthy of consultation by his colleagues. This entails interpretation of results and is the real justification for the existence of the clinical pathologist. To do this with competence requires a wide knowledge of pathology and of subjects allied to it. He must have a good knowledge of medicine and surgery and in the assessment of bone or chest disease some knowledge of radiology will be a great help. Knowledge of how to consult should be obtained as early as possible and a certain amount will be learned during the laboratory training. This might well be supplemented by clinicopathological conferences or by lectures, panel or round-table discussions given with the aid of specialists in subjects other than pathology. If such supplementary help were to be given to trainee pathologists then this would be a wonderful opportunity for the Association to fill a gap in postgraduate education. This is a responsibility which we should accept. The pioneer efforts of the Association in providing refresher courses for consultants should still be continued, and already discussions by the Council are in process for extending this activity. But a new field in providing facilities for pathologists in training lies wide open and the challenge awaits acceptance.

CONCLUSIONS

In this brief survey some of the problems in medical education have been pointed out and the way in which they affect pathology. At the moment the struggle consists of the relative amounts of time that should be spent in the pre-clinical or educational and

in the clinical or applied parts of the course. In the early days it was all applied and now the pendulum has swung far in the opposite direction, maybe too far. Educationalists are mostly in the older age group and at this time of life one's deficiencies in the basic subjects become even more apparent.

Great emphasis has been laid in some quarters on educational methods such as visual aids, close-circuit television, teaching machines, and the like. But oddly enough little has been said of the teacher himself or of any training which might prove beneficial. Most of us on reflection about our interest in a particular subject find that we owe it to one individual who was able in some remarkable way to convey enthusiasm to us. It is to be hoped that attention will be given to this matter, for even in a technological age where knowledge of new techniques is essential, the power of personality in the teacher is still an important force. It has often been said that a teacher must have an interest in research and indeed many teachers have been appointed for their research ability with disastrous results. There are so few really good research workers that it is unreasonable to expect many to be successful. As a result we find so many unsuitable persons trying to do research, and the few suitable ones hampered by limited resources. It would be much wiser to grant full facilities to the few.

When the College of Pathologists was formed the most important thing it did was to unite pathologists. Pathology is a wide subject which pervades every medical field and with increasing specialization in its branches it might become too diffuse and lose its identity. In educating medical students it is vital that they see the importance of pathology as a whole in its application to medicine. Having given consideration to these matters and realizing the problems that we face can anyone doubt that the Association and its members have a most important role to play in the future of medical education?