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THE EXTENSION OF THE FULL-TIME PLAN OF TEACHING TO CLINICAL MEDICINE[1]

YOU have done me the honor to invite me to speak to your graduating class at your commencement exercises. Let me tell you how much I appreciate it, and how glad I am of the opportunity to affirm my profound faith in the special fitness of women for the medical profession. As practising physicians, the large numbers of successful women, of whom your city and your school have had many conspicuous examples, make the question of their value a closed subject. There are perhaps fewer women working on the scientific side of medicine, but no one would now advocate eliminating the work of a Madame Curie, because of a prejudice against the sex of the worker. In relation to education, may I call your attention to the fact that yesterday the Johns Hopkins University honored a woman, Miss M. Carey Thomas, retiring president of Bryn Mawr College, because she is one of the outstanding educators of our day. She has a relation to medical education because her vision and her profound faith in the value of the college training as a preparation for medical education had raised the standards of medical education in this country. Thus it seems to me that the question of giving women a medical training has now been settled, but there is one place where women who are now studying may increase rather than decrease the prejudice against giving women adequate chances for a medical education, namely, if the women who have been adequately trained so lightly give up all use of that training when they marry. English women have been able to carry on the practice of medicine after mar-

[1] Address delivered at the seventieth commencement exercises of the Woman's Medical College, Philadelphia, Pennsylvania.

riage and it is quite possible for married women to do scientific work or public health work of a high order if they have the ability and the training, so there is no reason why the responsibility to the community for using expert training should not be forcibly presented to our students. Indeed, one of the next steps in the feminist movement is for educated married women to claim and to carry on a share of professional work.

I desire, however, to speak this morning on a subject of more general interest in medical education, a subject which it may be possible to apply only to medical schools connected with univerrsities at the present time but one of such general importance to the medical profession that I most earnestly bespeak for it your sympathetic interest. I refer to the extension of the so-called full-time scheme to the clinical branches.

About thirty years ago, the full-time plan of teaching was introduced into the pre-clinical departments of our medical schools. At that time the pre-clinical sciences were unproductive servants of the clinical branches and were taught by practicing physicians as a side issue; they are now represented by professional anatomists, physiologists, chemists and pathologists. No one questions the value of the change. The idea was but the extension into the medical training of the fundamental principle that teaching is a highly specialized profession. It has not been very long since the presidents of our colleges were ministers, now they are professional educators. The thought that it was now time to apply the same principles of education to the clinical branches that had wrought so much progress elsewhere can be traced, I think, to the late Professor Mall and Mr. Abraham Flexner. The experiment is now being tried in several of our medical schools which are a part of universities, but the plan is having an even more difficult time to win support than did the earlier experiment with the scientific side. It is not yet clearly understood by our students and has therefore not yet won their enthusiastic sympathy; and it is still actively opposed by some of the medical profession. The reasons for these difficulties are threefold: first, the failure to keep the fundamental principles involved distinct from personalities; second, the greater complexity of the actual scientific problems involved, and third, certain practical difficulties in putting the plan into effect.

The fundamental principle, as I see it, is a recognition of the value of education to the community. It states boldly that a great educator in clinical medicine is as great an asset to the community as a great practitioner of medicine. To set any great value on teaching runs counter to popular belief. If you are accustomed to look facts in the face you will admit this to be true. You all know the phrase, "he who can, does; he who can not, teaches." You all remember that the most frequent criticism of Wilson was that his training had been only that of a teacher. In Wells' history there is a statement of the exact truth about education; that we treat it in a beggarly, niggardly way. The funds for education are in part an endowment that is given by a few people; and, in part, they have been won from unwilling and uncomprehending legislatures. What a pitiful contrast do the sums we spend on teaching make with the sums we spend on war!

In studying the problem, it is first essential to analyze the relation of research to teaching. On the scientific side, it is now established with sound wisdom that all teachers should be engaged in research. It is based on the idea that universities shall be the home of intellectual progress; that they should have a double function, the advancement of knowledge and the training of those who shall carry it on. Research is the teacher's own professional work, it is that which he does; it makes plain to his students and to his colleagues the quality of his mentality and it is his contribution to the knowledge of his day. Only to minds of feeble comprehension does the carrying on of research mean any lessening of the value of teaching; research lifts teaching to a higher plane. It is perhaps better to say that no one can be a really great educator unless he is himself an investigator, either in the subject matter or in the methods of education, and can lead students, in part, into research, and, in part, to carry into all work the spirit and

method of research. It may here be made clear that no school expects all of its students to undertake scientific investigation; indeed only a part and perhaps but a small part of the student body either want to or are fitted for it, but our schools must hold in research those who are to be the next generation of teachers. Thus the extension of the full-time scheme throughout the medical training means putting the entire medical training into the hands of professional educators.

The full-time scheme in clinical medicine substitutes research to be associated with teaching, instead of the practice of medicine. The progress of medicine of the past thirty years has brought us face to face with something quite new, namely, with preventive medicine as a reality instead of a dream. We need no longer say diseases may disappear, but diseases are disappearing. It is this fact that calls for something really profound in the reorganization of medical education. When I began the study of medicine twenty-six years ago, we learned clinical medicine mainly in the typhoid wards. In the fall nearly everything on the medical side gave way to typhoid; now our students hardly see it. The most vivid memories of my year of internship are of typhoid tubs and the elaborate reasons for believing in them; our students will now carry away the impression of the value of sanitation and the efficacy of typhoid vaccine. In China, last summer, the contrast between preventive and palliative medicine became clearer to my mind than ever before. I was hearing of deaths from malaria and discussions as to whether it was wiser for the traveler to take small preventive doses of quinine or not, some saying that the subsequent treatment in case of infection was less effective if these preliminary doses had been taken. I knew that in reality only certain places at home had really eliminated malaria; but I also knew that our own department of clinical microscopy was having a difficult time to get enough blood infected with malarial parasites to teach our students the characteristics of the organism. With our present knowledge it is easy to see that the better way for China to deal with malaria is to get rid of mosquitoes rather than to import quinine, but it is just as clear that until there is money enough and enough of a civic organization in China to undertake sanitation, the palliative treatment of each case of malaria is the only feasible plan. At least it is easy to see which type of work has the greater ultimate value, the research which shows that the mosquito is the intermediate host of malaria and shows how to eliminate the disease or the discovery of the effect of quinine and the treatment of each case. Such a contrast by no means disparages the skill of clinical diagnosis and treatment; it is quite clear that palliative medicine must remain as the measure of the failure and ignorance of preventive medicine. In the full-time scheme as applied to clinical medicine, we recognize that preventive medicine has so far advanced that we can demand that the few leaders of medical education shall have as their major intellectual interest the growth of scientific medicine. The actual dealing with the sick is an ancient and honorable profession; but the science of preventive medicine is a profession on a still higher plane and it is now legitimate to ask that those who are teaching in a profession which is thus changing shall themselves contribute to that change. The research which brings new methods is of greater ultimate value than the immediate practical application of our present knowledge.

It must again be emphasized that practical applications of knowledge are in no way to be despised. The practise of medicine must be palliative but I should here like to pay tribute to the progress of curative medicine. There has developed on the clinical side of modern medicine a degree of expert skill in diagnosis of which I believe many workers on the purely scientific side are unaware and underestimate. Our students must acquire this skill; there are certain parts of the medical training where I believe our students should be really expert when they are graduated, namely: in the technique of clinical microscopy, in the methods of medical and surgical diagnosis, and in the aseptic technique of modern surgery. In their attitude toward curative medicine, those who are working on the scientific side should keep clearly in mind that the amount of curative medicine necessary is the measure of the defi-

ciencies of their own branch of the work. To make up these deficiencies of preventive medicine we must continue to develop the curative side, but beside the technique of curative medicine our students must now have also a training that shall enable them to continue to develop with the growth of medical knowledge and this, the greatest asset of an education, demands educational institutions that are themselves the sources of such growth.

It is frequently said by those who oppose the full-time scheme, that workers in laboratories do not possess technical clinical skill. It is true; moreover, those who are to teach on the clinical side must have clinical skill, their work must be with patients. But for those who are to be our clinical teachers the contrast is not between the laboratory and the clinic but between private practice as against practice with patients in hospitals. From the standpoint of acquiring skill and experience for the doctor, it seems to me that there can be no question but that the advantage lies in having patients in hospitals. To illustrate, Osler's well-known text-book of medicine was written as a record of his experience and that of his colleagues in dealing with the sick in the Johns Hopkins Hospital. One might make it still stronger and say that it is only in hospitals that studies and records of clinical material adequate enough to make any large contribution to clinical medicine can be made. Indeed, to go back historically, the early studies on tuberculosis of the great French physician, Louis, were made from records of patients in a hospital and started the idea that the hospital is the laboratory of clinical material. Indeed, at the present time many of the exceptionally successful physicians in private practice are developing hospitals of their own of which the Mayo clinic is a conspicuous example. For surgery, practically all of the work has already been transferred to hospitals, and for medical practice, the advantages to the patient are producing the same change. Thus, even if it be admitted, and it can not be doubted, that for the study of disease the hospital has every advantage over the home, still the opponents of the full-time scheme have often claimed that on the side of making human contacts, of learning how to deal with people, the private practitioner has a kind of experience that a teacher and a physician who deals only with patients in hospitals never acquires—I deny it. The school and hospital are as much a part of the world as the sick man in his home. The same ability to have really great influence in dealing with people makes toward success in a hospital or in a class room as in a private practice. There are two facts, however, which we should recognize, if we want to see all sides of the question. First, the teacher is somewhat artificially protected from the consequences of poor work. The teacher is always dealing with minds that are immature in his particular subject; and in the organization of our educational system the criticisms of students, that is, of those who are most affected by inefficient teaching, are allowed but little weight. I understand that in England students are not so docile as with us. Moreover, the very low salaries paid to teachers have led institutions to offer security of tenure as a compensation. We should recognize this, our institutions should set an adequate value upon the profession of teaching, and should demand high standards of work. Secondly, hospitals develop a routine in which the feelings of people are forgotten. If many of our hospitals had more of the spirit of exceedingly efficient service that characterizes our best hotels, there would be less room for legitimate criticism of caring for the sick in institutions. I do not think that this criticism applies so much to the smaller hospitals, but in some of the larger ones, where the actual medical work is done exceedingly well, the management of the institution could learn much from efficient business.

Thus we are quite willing to admit the deficiencies of our present educational system; we believe that it should be subjected to criticism, for it is better that its faults should be known than concealed. We recognize all the advantages of curative medicine, and that our present skill in dealing with disease represents a great achievement; nevertheless, we believe that the whole of medical education should be in the hands of professional educators who will recognize that the still more brilliant achieve-

ments of preventive medicine have brought us to a stage where we need to reorganize clinical teaching on the basis of research. To my mind this is the fundamental point and the final argument. Up to this time, preventive medicine has been left for the most part to chance and to boards of public health who applied what knowledge they had but attracted to their services, for the most part, only men of moderate ability. The reorganization of medical schools consists in focussing the minds of the ablest men in the profession on the problems of advance in medicine in contrast to the ideas associated with the practical applications of knowledge. This is the meaning of stressing research instead of the practical side in educational institutions.

On this plane, I believe that you will admit the principle of the full-time scheme. What are the practical difficulties? The first one is due to the complexities of clinical problems. If you analyze the progress of scientific medicine, it is astonishing how many of the discoveries that have really changed medicine in any fundamental way have come, not from the clinics, but from the laboratories; for example, diphtheria antitoxin, the whole treatment of infections by means of serums, and the discoveries of the action of the glands of internal secretion. In fact, in connection with this latter subject, there is abundant reason to demand that clinical applications of our knowledge shall measure up to the standards of sound physiological experiments. It is obvious that the materials of research are more readily handled in the laboratory than in the clinic. In the laboratory ideas can be subjected to experiment and the number of variables can be limited in these experiments in a manner not possible in dealing with patients. In the early days of the application of the idea of the full-time plan to clinical work, the first research done in clinical laboratories was pure anatomy, pure physiology and pure chemistry and was done no better than it was being done in the pre-clinic departments. It was asked and asked legitimately if there is such a thing as pure clinical research. Already we see light in this matter. There have now developed certain combinations between the workers in the pre-clinical departments and the clinics of advantage to both. I may instance the brilliant progress which has come from the laboratories of nutritional chemistry and the departments of pediatrics in the study of rickets. Here three different techniques have been brought to bear on a problem of profound interest to clinical medicine, namely, the nutritional experiments of McCollum combined with the clinical and histological methods by Park and Shipley. In the nutritional experiments on rats, McCollum and Simmonds have not only been able to produce rickets but other bone deficiencies as well and are now analyzing the effects of sunlight as well as of diets on these deficiencies. Indeed, the brilliant results in nutritional chemistry of Hopkins in England, of Mendel and McCollum in this country, demand an extension to the clinical field as a logical conclusion of their work.

Surgery gives another example of a place where such combinations are of value, for in surgery we are now passing into a phase where further progress depends on a utilization of various methods of the pre-clinical sciences. The actual technique of surgical operations has now reached a high degree of perfection and any great advance in surgery now depends on a more searching analysis of the reactions of tissues to surgical procedures. Indeed, if I may cite a particular example, we have in Dr. Halsted a man who has not only contributed very greatly to surgical technique during its period of marked development, but has also used surgical technique and the insight which his clinical experience has given him toward solving the problems of scientific medicine. Such an instance is to be found in his work on the thyroid, where he demonstrated that a graft of a thyroid gland does not take in an animal until an artificial deficiency has been produced.

On the other hand, there are certain problems with which it seems to me that the hope of progress lies with the underlying sciences. There are certain subjects where all the results which can be expected from simple methods have been obtained and where progress must be made by going deeply into the underlying causes. Such problems are to my mind illus-

trated in connection with blood and with the subject of the etiology of malignant growths. In connection with anemias, for example, we have had a complete survey of all the types of blood-cells that appear in the circulation under abnormal conditions, so that the hope of success now lies in a very careful study of the fundamental origin and relation of the types of blood-cells in the hope of finding out how to stimulate them differentially. If you will permit me to speak for a moment of my own work, it is now possible to cut out the blastoderm of a chick and watch it develop under the microscope, in a hanging drop preparation. In such a preparation, one can see the development of the blood-cells in the embryonic membranes of the living specimen. On the second day of incubation only red cells arise and they can be seen to come from the endothelial walls of the blood-vessels. The white cells on the other hand begin to appear on the third day. They come in part from new cells that differentiate directly from mesenchyme without becoming a part of the lining of a vessel. Moreover, the type of the white corpuscles that come from endothelium, namely, the monocytes, have the same kind of phagocytic activity, with the storage of phagocytized material, that characterizes the parent endothelium. These observations seem to me to open up anew the question of relationship of the white cells of the blood, from the standpoint of their classification on the basis of function. In connection with the great subject of new growths it is clear that we now await the discovery of their fundamental cause and that toward this discovery we need certain very fundamental biological studies in connection with the reactions of cells to normal and abnormal conditions; such as, for example, are involved in the investigations of Loeb, Murphy and others.

Problems which can be solved by purely clinical methods, or problems which need for their completion the application of clinical methods are not lacking. Indeed, their roots cover the whole period of modern medicine. In the full-time scheme, it is the argument that these problems can be solved at enormously greater advantage by a group of men concentrating their interests on the study of patients in hospitals rather than in private practice. The idea involves changing the emphasis of the interests of the leaders of the medical profession from the application of knowledge to the cure of disease, to the study of the problems of disease. It is, I believe, clear that, in the development of medicine, there is a very wide range of problems that are immediately feasible, some of them to be attacked in the laboratories of the pre-clinical sciences, some in the wards of hospitals, and some by combinations of workers in laboratories and in the clinics; but that all of them will gain by being in the hands of those to whom their solution is a major interest seems absolutely certain.

In the development of a group of scientific workers in direct connection with clinics who are actually engaged in applying the technique of the underlying sciences to clinical problems, there have grown up two groups of workers doing the same kind of work, one in connection with the clinics and the other in the pre-clinical departments. In this connection there have come discrepancies in salaries, the workers on the clinical side receiving the higher salary and ultimately the greater reward. The student becomes interested in research while still a student and finds that if he joins a clinical staff and does the same type of work that he might have done in a pre-clinical laboratory he will gain more respect from the university. Already there is beginning to be some surprise that such a system works against the fundamental sciences. It is said frankly that a man who keeps in touch with the clinical branches has a greater earning capacity in the community than the man who severs his connection with practice and devotes himself to the fundamental sciences. This in my judgment is a direct challenge to the leaders of universities to renew their faith in the kind of work for which universities exist. They must remedy this condition before the laboratories are depleted of their workers; they must show clearly that in estimating the use of a university they do not accept the popular estimate of the value of the practice of medicine over and above its study; and

finally that they have a clear view of the merits of preventive as compared with palliative medicine. The public would always pay more to have a given case cured than to have all cases of a given disease prevented, but leaders of universities must not fall into this error. Universities should rather lead than follow public opinion. In great contrast to public opinion, it is interesting to note that the most conspicuously successful and hard-headed business man of our time has judged it wise to make his total contribution toward the study of disease. The condition of discrimination against the fundamental sciences is also a menace to universities unless they wish to lose the abler men in the pre-clinical branches who have proved themselves fundamental on two scores, on making progress, and on training workers in the methods of research. I do not believe that increased salaries of those engaged in educational work will come through any organization of teachers. The associations of teachers have always been based on the principle of improving their professional standards instead of seeking for personal gain. The profession of teaching is concerned in a very fundamental way with the ideals of giving and helping, rather than receiving. But there are signs that the community as a whole is beginning to think of the value of education. Progress through the light of reason may not be rapid, but there lurks in the minds of all of us a memory of the poison gases of the late war and a consciousness that no antidotes are to be found against them except through trained minds. It is only with regret that one appeals to the educational force of war, but it can not be escaped. It is probable that the contact of the university with the increased earning capacity of modern medicine and with the need in commercial life for men trained in science will work out to the advantage of education in two ways, first, in the bringing of more adequate funds to education, and second, in the drawing of abler people into universities, thus raising the standards of teaching.

I have claimed that the idea at the root of the full-time scheme is better teaching and more research. In the practical working out of the plan it has not always been clear that the balance of high ideals of teaching lies with the full-time scheme. If this were made clear the plan would readily win the support of the entire body of students. By the time a student has reached the third and fourth years of the medical course, he has no longer the idea that teaching does not matter; he really wants help and guidance. Marked ability to teach is not common; exceptional ability is as rare in teaching as it is in any other profession. A man who is practicing medicine may easily have as much ability to teach as a man who is doing research, and indeed, in many of the medical schools, there are practicing physicians who are doing excellent work in teaching. The universities have asked these men to teach, giving them either no salaries or salaries that are merely nominal, and have expected them to gain compensation in experience as an asset to the practice of medicine. The full-time scheme must not be considered as an attack on these men but merely as the next step in the progress of medical education which demands that educational institutions shall now select, and draw into their teaching force, a group of men who shall devote their entire energy to teaching and research. If this can be done, one can hardly question but that the advances of the past thirty years of professional teaching of the pre-clinical side will be duplicated on the clinical side.

It is clear that two factors have given us a very much larger staff of teachers on the clinical than on the pre-clinical side. The first is the legitimate factor of the development of the great number of specialties. The second is the fact that many clinical teachers have put only a small part of their time into teaching and the fact that the custom of the medical school of paying them practically nothing has made it easy to increase their numbers. With the change of emphasis on teaching and research, it is obviously impossible to put all of this large group on the full-time basis with adequate salaries. The change can be made rapidly in the organization of new institutions but must be made gradually in the older ones, where only a few of the teachers in the main branches of medicine and surgery, together with representatives of some of the specialties,

varying according to local conditions, can be put on the full-time plan in the beginning. This can be done with the confident expectation that the principle which is the more sound toward improving education will win out in the end.

The development of modern scientific medicine with all its expert skill, and especially the skill of modern surgery, has brought the same possibilities of exaggerated financial reward into medicine that has followed the development of machinery into industry. Moreover, in the practise of medicine, a chair in a great institution serves as the same enormous financial asset as advertising in business. These facts are conspicuous and hence overestimated. The number of men making conspicuous wealth in medicine is not large. The skill of the physician deserves an adequate reward. Unfortunately it has been made to appear as if the fundamental reason for the full-time scheme was an attack on commercialism in medicine. It is not true; the fundamental reason is much more profound, more constructive, it concerns the development of higher ideals of research and teaching. It is true that the development of the full-time scheme makes large demands in terms of ability; it needs men with ability for research, for teaching, and for organization, but men for whom ideals and the chance for a brilliant achievement may outweigh the pursuit of excessive wealth. I say excessive wealth advisedly; the advantages to the community have already been so enormous in the development of scientific medicine, and it is so logically the next step to bring clinical medicine under the principle underlying this progress, that it should be possible to give adequate support to this new development.

I said at the beginning that there had been considerable opposition on the part of the medical profession to the full-time scheme. This opposition I believe to be due to a lack of understanding of the principles involved and to the difficulties of transition. One certainly hears some suggestion, vaguely expressed, perhaps not wholly consciously formulated, of a fear of preventive medicine. To this there can be only one answer. To preventive medicine the medical profession must adjust itself. It is obvious that eliminating typhoid, malaria, typhus, smallpox, cholera and so forth have so far not emptied our hospitals nor diminished the need for doctors; indeed, along with preventive work, many conditions have come into the range of treatment which were formerly untouched, so that up to the present time the effect of preventive medicine has been expressed largely in a lengthening of the expectation of life. This fact, together with the eliminating of many of the weaker schools of medicine, makes it sure that the effects of preventive medicine on the profession belong to another generation, not to ours. When the time comes, the medical profession will make the only possible adjustment of training fewer physicians.

In conclusion, I may say that I do not think that all the problems associated with the practical extension of the full-time scheme to the clinical side have been solved. Adjustments may have to be made, perhaps radical ones, but I profoundly hope that the plan will be given an adequate trial and that it can win the support of those who are teaching in our medical schools, because I believe it of the utmost importance to the community to range the ablest minds in the medical profession on the side of preventive medicine. Besides an occasional school of hygiene and public health we need to have all of the leaders of medical education engaged in research to advance medicine. It is my sincere conviction that the opposition to extending the modern standards of professional education to clinical medicine will yield readily to sound constructive leadership on the part of those who desire this reform.

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PRELIMINARY REPORT ON AMERICAN BIOLOGICAL STAINS

As previously mentioned in this journal,[1] a committee was organized under the auspices of the National Research Council last fall for

[1] "The Standardization of Biological Stains," SCIENCE N. S. LV, 43-44; Conn, H. J.: "American Biological Stains Compared with Those of Grübler," SCIENCE, N. S. LV, 284-285.