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THE CHOICE OF A PROFESSION—MEDICAL[1]

IN accepting the kind invitation of Professor Hartson to address you to-day I was fully conscious of my inability to place before you a complete picture of the possibilities of medicine as a career. As a matter of fact, the field of medicine has become so broad that even those possessed of the maturity, wisdom and experience of a long life devoted to medicine in its widest purposes would find it difficult to speak with authority on any but a limited aspect of the question at hand. It is, nevertheless, true that any university teacher in medicine must have a sufficiently general knowledge of the topic to outline to you the general scope of medicine, and at the same time depict to you the aim, ambitions and rewards that are common to those working in the many diverse fields of this profession. I am, therefore, very grateful for this opportunity.

Medicine is that science which relates to the prevention, cure or alleviation of disease. Undoubtedly in most ancient times it dealt purely with the alleviation of suffering. Doubtless it had at that time the closest possible relation with religion, for disease, even down to recent times, was looked upon as a visitation by an evil spirit. The cure was obvious—the evil spirit was either bought off or chased away. As mankind became civilized, certain diseases were seen to recur regularly and in each instance to cause the same symptoms, and a true medical science developed, and the devil was relieved of another undeserved opprobrium. Soon a connection was seen with external conditions, and man learned a little regarding the prevention of diseases and began to study the conditions under which the body was most likely to remain free from disease. By the fourth century before Christ medicine had become a learned profession, and in the writings of Hippocrates, that great leader of the School of Cos and usually spoken of as the "Father of Medicine," we find not only a very clear description of many diseases but lengthy discourses concerning the conditions under which the body can be kept in good health and disease prevented.

In view of this it may seem extraordinary that quackery, miracle healing and a very diversified number of medical cults exist and flourish even to-

[1] Address to the senior class of Oberlin College, May 25, 1925, as an exercise in a course covering vocational guidance.

day. We should recall, however, that there are three parasites which have clung to each successive stage of civilization—quackery, drunkenness and prostitution. These parasites have maintained vigor, persistence and superiority over all the efforts of church, state and society; quackery, chiefly because of human gullibility.

Since, as a science, medicine deals with the prevention and treatment of disease, it is obvious that its chief efforts are devoted to a study of the causes of disease. Thus in modern medicine—that is, since the time of Louis Pasteur—the greatest efforts have been directed towards the classification and study of bacteria and the results they produce, since it is now known that a great proportion of all diseases is caused by the invasion of the body by bacteria. There has grown, as a result of this, an almost separate science—*bacteriology*. It is the workers, in this and allied fields, that are responsible for our finding out that certain bacteria when they grow produce a toxin or poison, and that in turn an antitoxin or something to counteract the poison may be made outside the body and then injected into people sick with an infection by a particular bacterium. The accessions to medical knowledge from this field have been productive of the greatest benefit to mankind.

But medicine is not so simple that a knowledge of the causes of disease will assure us an immediate remedy. In the first place bacteria are not the cause of all forms of disease; and tumors, disorders of the brain and many great groups of diseases may have a quite different etiology. There are still many groups of diseases the causes of which are entirely unknown. However, even if the causes of all diseases were known, there would still be much more to medicine, chiefly perhaps because of the variations in individuals. No two people are either built exactly alike nor do they react the same to similar stimuli. This, indeed, is one of the reasons why medicine is such an absorbing vocation. There are always problems. Each case of pneumonia, for example, differs from the next and requires much thought before a satisfactory course of treatment is outlined. It is the antithesis of the machine, absolutely unstereotyped, and demands continued intellectual exercise and individual adjustment. It should appeal to those who like independence of action and can bear the heavy responsibility that such action entails. And it should appeal to those who have curiosity—for to enter the Profession of Medicine is to enter upon an education that is never finished. One continues to learn until the last patient is seen or the last experiment finished.

The foundations for this individual variation which makes medicine so interesting rest upon variations in structure and in function. These matters of structure and function have received the most profound attention. The study of the structure of the body we call *anatomy*, the study of the function of the various parts of the body we call *physiology*. Certain individuals have elected to spend their time in the laboratories exploring these realms of science and have in turn added greatly to our ability to understand disease and how to treat it. Their studies of individual variations give us some hint at the reasons for the great variations in the picture of the same disease in different individuals. Those who elected to study structure soon explored not only the coarser but the microscopical structure of the body—*histology*. Having ascertained most of these facts they have turned in recent years to a careful investigation of the development that occurs in the growth of an organism from its first beginnings. This latter branch of medicine we call *embryology*, and studies in this field have thrown much light upon that great group of disorders roughly classified as congenital abnormalities, such as a split lip, the absence of fingers, the occurrence of hernia or rupture and the absence of certain bones or viscera. In order to appreciate better the development and use of certain structures, a few workers in this field have devoted much of their time to the study of the development of allied mammals, and the sciences of comparative anatomy and anthropology have become the workshop of the mediciner.

In the study of the function of the various organs and parts of the body—physiology—medicine has learned a vast amount of the greatest practical value. Imagine a doctor without a knowledge of the function of the circulation of the blood, the function of the lungs or of the digestive tract! This field has always drawn a large share of the brilliant minds in medicine. Laboratory workers in this field give annually to the practitioners facts of the greatest importance in both the diagnosis and treatment of disease. A whole lifetime devoted today to the function of the circulations, under the circumstances imposed by disease, would be of the greatest practical value.

Certain studies of function led directly into *chemistry*. Thus the ultimate study of the intestinal juices revealed the fact that, in the digestion of food, intricate chemical reactions take place which might well be interrupted in disease. We might use as an example the fact that normal digestion in the stomach only occurs if the reaction of the juices is acid; the reverse is present in the small intestines. Again, we find that the exercise of a muscle leads to the local production of acidity. All such problems need investigation if we are to care wisely for our sick. And workers in this field require special

training. Hence, the subdivision of physiological chemistry has arisen among the medical sciences.

Also in this field of function lies the science of *pharmacology*—literally, the knowledge of preparing medicines—actually, the study of the effects of drugs. This was an early subdivision of medicine in the day when "opposites" was the rule. Thus, diarrhoea was treated by a medicine to stop up the bowels, quite unconscious of the obvious deduction which might be drawn that diarrhoea resulted from an effort on the part of the body to get rid of an obnoxious matter and that, therefore, the logical treatment should be castor oil. Thanks to this science, we use fewer drugs but know more about them.

Finally and perhaps foremost of the sciences upon which the great structure of medicine rests is the science of pathology. Pathology literally translated has practically the same meaning as medicine, that is—that science dealing with the form, structure and symptoms of disease. In a practical sense it means the study of diseased tissue. It constitutes, with anatomy and physiology, the tripos upon which medicine rests. To some extent bacteriology is merely one of its subdivisions. It was a favorite field for study long before bacteria were recognized as a cause of disease. Examination after death reveals alterations in organs which are the results of the disease. A study of such alternations in many cases may well reveal all the states of the disease and thereby stimulate ideas as to possible treatment or prophylaxis or indeed give rise to further experimental study before the answer is at hand. The workers in this field have the closest contact with the practitioners; it is they who perform autopsies and examine specimens removed at operation. As has been often said, "in the dead-house lie the facts." One may hear many wonderful sounds with a stethoscope—that instrument with which a doctor listens to the heart and lungs, and often uses to amuse or terrify his youthful patients—sounds for which examination after death reveals no possible source. If one has ever had in one's hand the lung from a patient dead from tuberculosis and seen the cavities with small arteries strung across these cavities like telegraph wires, one can better understand the sounds that might be made by air entering and leaving such a cavity; and one can easily appreciate the source of the blood that such patients frequently spit up. Facts of this nature can not be learned from books nor lectures. Experience is the best master, and where it becomes a question of being entrusted with life in the future, none but the best masters should be consulted.

So much for a picture of the fundamental sciences upon which rests the profession of medicine. I have discussed them in some detail because it would be wrong for me to leave behind with you only that side that has to do with *practice*. As college graduates you should want the complete picture and should recognize the value of all the component parts of the profession. Indeed, I hope there are some who may find the laboratory field, with its freedom for uninterrupted hours of investigation and its lack of personal responsibility, the more attractive.

Medicine is both an *art* and a *science*. In the minds of the laity it is sharply demarcated into those who practice and those who do not. The laity speak of the incumbents of these separate fields as practitioners on the one hand and as *laboratory workers* or *scientists* on the other. It is commonly thought that the practitioner is a large-hearted, level-headed, overworked individual with much common sense, of great practical value, whose opinion on almost all matters except those dealing with financial affairs is to be desired, trusted and followed. On the other hand, it is commonly held that the laboratory workers are quite different creatures, who have peculiar tastes, are visionary and impractical and whose opinion, therefore, is rarely asked except where the matter concerns his very special field. No one seems to know just what he does, why he does it or what it all means. They are merely tolerated and frequently thought to be queer folk! And yet what I have just related to you regarding the laboratory sciences must have proved to you how wrong this attitude is, and indeed I hope it has opened your eyes to the fact that it is the workers of this type who usually give the most far-reaching and important additions to our special knowledge.

This may serve to depict the gross and commonly conceived divisions of medicine. It is indeed peculiar that a profession so widely esteemed and so ancient, for it antedates in so far as schools go all professions except pedagogy, should be so little understood. In the first place the *art or practice* and the science or *accumulation of knowledge* of medicine can not be separated. Any practitioner may, and every practitioner should, seek to add to medical knowledge. The science of medicine can be learned at the bedside as well as in the laboratory. Many facts indeed can only be determined at the bedside, and accurate observation made there, if correlated and studied, may yield important facts. Moreover, observations made at the bedside are a great source for laboratory investigation. It is often the questions raised at the bedside that result in the most brilliant and useful form of laboratory investigations. Thus, not only must the practitioner have a scientific attitude, but the medical scientist must have some knowledge of the practice of medicine and preferably some

contact, perhaps in a hospital, with sick individuals. The sick patient becomes the source of inspiration.

Indeed, there are certain limitations imposed on purely laboratory workers. Take, as an example, the study of *pain* in relation to disease. The general sum of medical knowledge, that is science, must derive its information in this field in a large part from bedside studies and the correct observation of the type of pain in certain disorders. To be sure in the laboratory we cut sensory nerves, study the degeneration of the nerve tracts under the microscope, and thereby accurately determine the course of the nerve fibers which carry the stimuli back into the central nervous system where these stimuli are recognized as pain. But recall for a moment the limitations imposed by other animal investigations. The chief objection is that even if simple experimentally created conditions should give rise to pain the laboratory worker has no means of recognizing it. He is defeated because pain is a complex symptom which needs language for expression. The laboratory worker can not talk to an animal. Moreover, in spite of what may be said by those narrow people who call themselves antivivisectionists, no reputable worker would willingly perform experiments causing pain or with pain as the object if only because his intelligence would point out to him in advance the uselessness of such work. To these men it seems pitiful that there exist individuals who can not and will not see the larger purpose of animal investigations. Are the thousands of children's lives saved through the experimentation that resulted in the production of diphtheria antitoxin worth the sacrifice of a few animals, particularly when one considers that this addition to medical science, once ascertained, will continue indefinitely as a blessing to the succeeding generation of men?

I hope what has been said will make it clear to all of you that medicine is both an art and a science, but that it can not be divided into two or three or four classes, that any one who becomes a member of this profession may play a dominant rôle in its advancement, and that it is indeed a mistake to enter this profession with the idea that by going into practice one has no responsibility or opportunity to enlarge the limits of medicine or that by going into a laboratory one should or can cease to have any interest in the clinical aspect or practice of the profession.

In the *practice of medicine* there are even more numerous fields open to the man interested in laboratory work. Primarily he must choose between general medicine and the specialties. This choice will be based on many issues. The place in which an individual desires to locate may be the dominant issue; if it is small he should, unless there are special reasons, accept the rôle of the general practitioner. It may be his choice will depend upon financial matters, for to become a specialist means postgraduate study—certainly a period of internship in a hospital, and usually two to five years more of intensive study in his chosen field. Or it may be that his choice is dependent on the inspiration of some special teacher who has by his way of living, his success and his teaching, stimulated a desire for a similar life.

Few, I imagine, determine their "walk of life" on an analysis of what field they are best suited for. The reward even in medicine plays a prominent rôle. It is difficult to speak with finality concerning the rewards of practice. Indeed, it is difficult to measure the real rewards and to place them in words. Financially, the specialties, whether medical or surgical, yield more return than the general practice of medicine; but a successful practitioner of medicine, no matter what his field or specialty, will derive a satisfactory income.

Personally I feel this is a most unwise and foolish method of electing one's life work. The critical point in the choice of a career is the selection of work in which one will be happy. Joy in work is the surest road to success. In the selection of a career in the practice of medicine, this should be kept in mind. Those men who will do best in the field of general medicine are those with a broad, patient, sympathetic and philosophical outlook, who like people, who make contacts easily and who shoulder responsibility well. There is no career demanding finer attributes, nor one which will put those attributes to the test so severely. As a rule those men going into surgery are less patient and philosophical, who get pleasure from action, who are more finite, and like to see for themselves. They want to know whether they are right or wrong and they often get into the rut of "seeing is the only way of believing."

But I do not think that any presentation of the possible rewards or suitableness of one individual or another will help you in your choice. Your choice of medicine will be based on some larger vision of the whole. This is why I have emphasized the fundamentals in discussing medicine as a career. The real reward in medicine is not in dollars and cents. The ethics of the profession of medicine preclude a large financial reward, that is, large in comparison with business. Medicine does not need nor want in its ranks those who are activated by such motives. The chief rewards in the practice of medicine come to the individual doctor through the, often unspoken, devotion of his patients, through the sense of a task done to the best of his ability and through the knowledge that each day is sure to bring its interesting problems.

Perhaps the most lasting reward is the sense he has of the faith of the people in his profession. This faith in doctors is a wonderful heritage, patients will

tell secrets and problems of their lives to doctors which their families and clergy never hear—even to a new and strange doctor. It bespeaks long years of correct dealing, fine ideals and good service. This faith of the people is the one thing that keeps the profession of medicine as a whole at a high level. Doctors are no different from other folk, but their form of service, their work and the faith of people in them are calculated to bring out the best there is in them. There is something about suffering that strikes home at the best fibers. It is something that makes one glad to miss a night's sleep or a friend's dinner.

But pictures of rewards are not what should be shown to those electing a career. What you should see is the various phases of the work, so that what may interest you may be selected. Medicine needs no proselyting. It is a profession that deals with life, other than which man has no greater interest. It is rather that men should be discouraged from entering this field unless they profess a great interest and like work.

Those who contemplate entering medicine should have some preliminary scientific training. Unfortunately the major part of our early education is chiefly a practice in memory, that is, languages, history, geography, etc. Logic is of much assistance, but mathematics are scarcely as well drilled into students now as they used to be. And there is almost no training in the scientific method of accurate observation, the correlation of facts, the drawing of deductions from facts and the synthesis of facts. One of the greatest difficulties in first-year medical students is to teach them the value of a correct observation. It is true that chemistry and physics are gradually creeping into precollege curricula. But should we stop there? Why not actually teach students some of the facts of life and sacrifice a little syntax? Even if they never heard of medical schools, they might all be wiser, healthier and happier citizens for it.

May I again in closing ask you to consider your own qualifications before you reach any decision as to your choice of a career? Remember that it is extremely difficult to change one's field of work in the future. In medicine you can choose a very varied career; those of you with great curiosity, a wide vision and some ingenuity will doubtless be happier in some laboratory field; the more patient and philosophical will enter that most honorable career of a general practitioner; the less patient may become specialists.

The final choice must rest with one's interest—that interest can only be determined by actual contact. As regards an opportunity to advance the science of medicine and leave a lasting contribution for the good of mankind, all branches hold an equal opportunity. But no two students receive the same reaction. In one sense pathology and obstetrics are at opposite ends of the medical spectrum. Thus, pathology deals with the dead or critically ill and to a large degree deals with people on the downward trend of life, whereas obstetrics deals with the beginning of life, with young people and a period of life when there is usually much rejoicing. People reflect their lives. Pathologists are rarely boisterous folk, obstetricians are proverbially jovial and stout. Pathologists on the other hand have done a great deal more to advance our knowledge of disease. To some this difference of surroundings may be a matter of importance. You must see these different fields yourselves in order to choose wisely.

The doctor has always been somewhat cloistered from the world of affairs. Untrained in executive and business matters, and traditionally unsuccessful in these as a rule, he has been separated by his unsuitable training and by the urgent character of his work from any active part in public affairs. Indeed, he has been excused by law from some public duties that other men are obliged to do, and by common tradition has been free of criticism if he took less part in other such matters than do most men. Medicine has in fact attracted very largely men who temperamentally shun public activities. Besides this, one of the more or less definitely recognized large compensations in medicine, and one that has been jealously guarded and perpetuated, is that the doctor owes obedience to the law and to his own conscience, and is not subject to human masters.[2]

This sense of freedom from control with its obvious assumption of great individual responsibility may be a determining factor in the final choice of a few individuals. It may be that this constitutes one of the greatest differences between business affairs and the profession of medicine.

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AN OBJECTIVE DEMONSTRATION OF THE SHAPE OF CELLS IN MASSES[1]

IF the cells of plants or animals, whenever they are grouped in masses, are typically fourteen-sided bodies of a particular pattern, ought not that fact to find a place in every elementary presentation of structural

[2] Edsall, D. S., "Movements in Medicine." *Boston Med. & Surg. Jour.*, 1916, CLXXIV, 891–892.

[1] This review, written at the request of the editor, is a partial synopsis of two papers obtainable from the American Academy of Arts and Sciences, Boston: "The Typical Shape of Polyhedral Cells in Vegetable Parenchyma and the Restoration of that Shape following Cell Division" (Proc., Vol. 58, No. 15, 1923); "A Further Study of the Polyhedral Shapes of Cells: I. The Stel-