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ANNUAL ORATION

SOME RESPONSIBILITIES OF MEDICAL EDUCATION*

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TO DELIVER the Annual Oration of the Massachusetts Medical Society is an honorable privilege, for which I am grateful.

For almost fourteen years, as dean of the Faculty of Medicine, I have had the chief responsibility for the administration of the Harvard Medical School. This experience is the reason for my choice of subject and presumably the basis of the Society's choice of an orator. The organization and progress of medical education have been my chief preoccupation for these fourteen years, and I welcome the opportunity to place on record my faith and my optimism regarding it. As I have contemplated medical schools in general and the Harvard Medical School in particular, I have been asking myself with special insistence: what are these schools for, and what are they trying to accomplish? Even a general answer to these questions could be useful. In the next few weeks I shall leave the dean's office to return to teaching and research, hoping, as one may say, to regain my amateur standing, and so I speak with a particular sense of freedom and entirely for myself, not as a dean, but as a private citizen who has had some experience with these problems.

There are many reasons why it is pleasant to meet in Worcester. One is that it gives an opportunity to look at medical schools from a distance of some forty miles — a circumstance calculated to permit a view of the forest without being lost among the trees.

Members of the medical profession are not apt to consider the Army and the Navy as academic organizations, or to expect them to excel in educational enterprises. Nevertheless, some of the training programs of the armed forces during the war held lessons for formal educational organization. These training programs taught selected young men to fly, to detect submarines, to carry a gun or to speak German in what seemed to many professional educators a surprisingly short period. If one seeks causes for the success of these programs, so far as they were successful, he is apt to conclude that one factor was that the organizers of these programs were able to define with great clarity and simplicity the program's objectives. They were able to say what knowledge, what skills, what habits of mind and muscle they wished the trainee to acquire, and they could eliminate with complete ruthlessness any material, any exercise, any point of view that did not contribute to these specific and limited ends. The organizers of these training programs were not concerned with general education or with a distant future, but with an immediate, limited and definable goal. Moreover, they were able to select their candidates freely and to weed them out without hesitation.

I should be the last to deny that there are many differences between Army or Navy or Air Force training and medical education, but I do submit that medical schools would have better organization and planning if there were clearer understanding and better agreement as to the objectives of the medical school program.

The responsibilities of medical schools, to my mind, may be summarized in six major categories.

Provision of Instruction Leading to the Degree of Doctor of Medicine

When the Harvard Medical School began its work one hundred and sixty-seven years ago, its faculty was mainly concerned with offering instruction to prepare men directly for practice. The faculty of today continues to accept as a primary responsibility the provision of instruction leading to the M.D. degree, a course that is still the basis of an informed and competent profession. As we approach a discussion of this first basic objective, the undergraduate course, we encounter the theme

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of this address, if it can be said to have one. That theme is as follows: a characteristic of twentieth-century medicine is *rapid change* in knowledge and in practice.

In David McCord's* anthology of light verse, there is a composition by Mr. Newman Levy that concerns the characteristically rapid change of modern life. It is entitled "I Wonder What Became of Rand, McNally," and the most relevant verses run thus:

> Mr. Rand and Mr. McNally,
> Arbiters of hill and valley,
> Portraitists of sea and land,
> Mr. McNally and Mr. Rand.
> Two sad cartographic chaps,
> Sat in their office surrounded by maps.
> Globes and maps around the room,
> And on *their* maps a look of gloom.
>
> "Time was when this business of ours was grand,"
> Said Mr. McNally to Mr. Rand,
> "When our toughest job was to sit and think
> Shall France be purple and Britain pink?
> Shall Spain be tinted a bright cerise,
> And perhaps a dash of green for Greece?"
>
> "But that," said Rand to Mr. McNally,
> "Was before Benito got rough with Hallie,
> When we didn't fret about changing borders,
> And we just sat here receiving orders."
>
> "Remember those days," McNally said,
> "When we'd plan a map a month ahead,
> And we'd know, if it came out at noon, let's say,
> It was up to date the entire day?"
>
> "Those days," said Rand, "are gone *totally*."
> "You said it, brother," said Mr. McNally.

The changes of the recent past have multiplied the variety of careers in medicine. Those equipped with medical training may translate it into the practice of surgery or of psychiatry, into general practice or that of ophthalmology. They may go into research and work with methods as diverse as those of nuclear physics, of statistics and of psychoanalysis. They may go into teaching, or into hospital or medical-school administration. The basic course, then, must *be* a basic course, not aimed simply or singly at preparing men for any one of these careers, but qualified to serve as a foundation for all. It must do better than this; it must serve as a foundation for types of careers that are still unknown but that will surely evolve in the years ahead.

A suitable plan of instruction, in a changing world, is concerned with developing in students not only knowledge of facts, not only good ways of using facts, but in particular, and at all possible times, providing a basis for understanding facts. Medicine should be taught, so far as our knowledge permits, in terms of the mechanisms of the phenomena of health and disease, thinking all the time about "why" and seeking always (to borrow a phrase from that rich source of memorable phrases, Mr. Winston Churchill) "the unique and inexorable sequence of cause and effect."

Teaching based on this principle is often successful and stimulating; one is tempted to think that emphasis on mechanisms and sequences is perhaps the chief merit of modern medical education. There is another point in favor of this philosophy. If one believes that a chief function of what we may agree to call undergraduate medical education is to establish a basis for the continuing self-education of graduates; then emphasis on understanding is of central importance. The war was a testing ground for men and for methods of education. Many colleagues, on the basis of their war experience, have brought forcibly to my attention two attributes of the young physicians who during the war were best able to adapt themselves to unfamiliar varieties of medical activity. Let us remember that these unfamiliar varieties of medical activity were carried on under unfamiliar and difficult circumstances and by unfamiliar methods. These attributes of professional success were, first, stability and integrity of character, and, second, a good basic understanding of disease in terms of pathology, physiology, immunology, psychobiology and the other general formulations that underlie our understanding of the interactions of man and his complex and changing environment. Such attributes permit a young man to adjust himself to the unfamiliar tasks of military medicine and permit him to adapt himself to and utilize the changes brought about by the advance of knowledge.

I conclude that a major objective of medical schools is to provide the M.D. candidate with educational opportunity planned to let him acquire an understanding of the mechanism and the natural history of man and his diseases. The degree is not a certification of fitness for practice; it is a certification of basic medical training — the decision of readiness for practice is another. In the United States the several states reserve to themselves the right to say when a physician is ready and suitable to practice his profession.

So much for this indispensable objective and duty of medical schools in training physicians for participation in the medicine of the future by the provision of instruction leading to the ancient and worthy degree of Doctor of Medicine.

Provision of Instruction Leading to the Degree of Doctor of Philosophy in one of the Medical Sciences

There is an over-all shortage of physicians. This assertion is the subject of general agreement although no two people are agreed about the degree of the shortage. But, however severe this shortage is, there is another shortage even more severe: that of teachers and investigators in the fields of the "medical" sciences such as physiology, biochemistry, pharmacology, pathology and bacteriology. The

*McCord, D. T. W. *What Cheer: An anthology of American and British humorous and witty verse gathered, sifted and salted.* 515 pp. New York: Coward-McCann, Inc., 1945.

explosive expansion of knowledge in these areas and the growth of research in universities, institutes, hospitals, Government departments and industry create a demand for competent scientists in these fields that is simply not being met.

Medical schools are now facing, more clearly than before, their share of responsibility for the basic training of these indispensable people. Adequate provision for training the successors to the present generation of such scientists is a part of the duty of universities and medical schools and one of the methods for expanding total medical personnel. Harvard University attempts to meet the problems by an ingenious collaboration between the preclinical departments of the Medical School, on the one hand, and the Faculty of Arts and Sciences on the other—a strong and useful combination called the Division of Medical Sciences. Before the war there were some 10 men a year in training as Ph.D. candidates in this division. This year there are 50—an example of a fivefold expansion of one part of the program of medical education. If medical schools do not accept their share of responsibility for training successors to the leaders of the medical sciences, teaching will suffer and the broad and expanding program of medical research will be restricted and injured.

Advancement of Knowledge by Research

The advancement of knowledge is a fundamental university objective, and a major responsibility of medical schools. These schools are in a position of peculiar advantage, standing as they do between the science departments of the university on the one hand and the great teaching hospitals on the other. The research armies of a medical school can make their attack on a wide front and have the enormous advantages of diverse talents and an integrated program. Medical schools, in my opinion (by some considered a prejudiced one), have in the long run great advantages over other forms of organization for medical research, such as research institutes and hospitals. The special advantages of medical schools as research centers include the favoring presence of students and the possibility of a broad, well based spectrum of research running from the infrared of the bedside to the ultraviolet of the basic sciences in the university. It is my conviction that research is not only an opportunity but also a duty of medical schools and that its spirit and performance should be expected of each professor (in varying kind and degree) and of every department. I am equally concerned that teaching (of varying kind and degree) should be expected of every professor and every department. The integration, the mutual stimulation of teaching and research is the most healthful exercise undertaken by individuals or departments. There is no fundamental schism between research and teaching, or between different kinds of research.

In a recent valuable report of the "Medical Curriculum Committee of the British Medical Association" (under the distinguished chairmanship of Professor Henry Cohen of the University of Liverpool) the following wise sentences occur:

> Claims of precedence or rivalry between clinician and laboratory researcher are falsely based and senseless; in Medicine, one cannot exist without the other; each must contribute his quota to the ultimate objective — the promotion of health, the relief of suffering and the elimination of disease in man. The scientific outlook and the humane approach in Medicine are complementary.

Research as an essential function of medical schools needs no defense: it advances knowledge, it helps all teaching, and it is indispensable to advanced training.

No one is going to quarrel very violently with the ideas expressed that training for the M.D. degree, training for the Ph.D. degree in medical sciences and research over a wide front are primary and pressing objectives of medical schools. Controversy, uncertainty and lack of knowledge are much more apparent when we come to consider the next objective.

Provision of Opportunity for Advanced Training for Practice, Teaching and Research

What are the varieties of advanced training that may concern medical schools? Let me illustrate by describing the situation as I see it in the Harvard Medical School at the moment. There are at least three groups of individuals to whose advanced training the medical school has some relation. First, there are about 175 students classified as research fellows. This long list includes doctors of medicine and doctors of philosophy in various medical sciences. They are learning by doing in the field of research and to some degree in the field of teaching. They participate in the work of research teams as a means of equipping themselves to do research on their own. It is from this kind of group that many of the teachers and investigators of the next generation will come. Medical schools clearly have a primary responsibility for providing opportunity to these men. It is a logical place for such work to be located because teachers and investigators in the medical sciences require experience in departments of medical sciences, and these exist, on the whole, in medical schools. It is equally important, to my mind, that the growth of investigators in clinical fields should also be centralized in medical schools because I believe that the evidence of the last twenty years indicates that the clinical investigators of this generation are not able, by themselves, to train the clinical investigators of the next generation, but that the evolution of these investigators, if they are to be effective, requires the help of medical-science departments of medical schools.

The second group is also a large one, less precisely related to the medical school, but clearly influenced

by many members of its faculty. This is the group receiving advanced training for practice, including house officers in the hospitals in which Harvard Medical School teaching is done, and also those who attend the so-called "courses for graduates." This is the field in which the least clarity regarding the role of the medical school exists. Obviously, medical schools cannot be responsible for all or even a large part of advanced training for practice, so that this is peculiarly an area in which definition of objectives and roles of different organizations is urgently needed.

The situation is made more of an emergency by the rapid development of specialty boards and the expansion of their requirements. To my mind, a particular danger threatens advanced training of these types. It is in danger of becoming stereotyped by over-organization, and so becoming preparation for the medicine of today or even yesterday, rather than for the medicine of tomorrow. This danger threatens M.D.'s (in training for practice, teaching and research in medicine) more than it does Ph.D.'s (in training for similar work in the medical sciences).

A point of view relating to this problem may be described in terms of the following case history:

Among the figures which stand out in the great army of men who have contributed to our knowledge of heart disease is the slender silhouette of James Hope. James Hope was born at Stockport in the county of Cheshire, England, on February 23, 1801. The grammar school at Macclesfield having given him what it could, he determined on a career in the law. Before he embarked on this course, however, he went into the Yeomanry Lancers (at the age of eighteen) and spent a year in military service, or something approaching it. At the age of nineteen he began the study of medicine at the University of Edinburgh. His medical-school career was somewhat irregular, since he left the school before the end of his final year to take an excellent hospital post that offered itself at that time. He took this job with the blessing of the faculty and returned in 1825 to present his thesis and to take his degree. At the time of his graduation, Hope was twenty-four years old, intelligent, able, ambitious and possessed in a high degree of a most valuable characteristic, the habit of effective and unremitting industry.

As a medical student he had paid particular attention to pathological anatomy and to pathological physiology, believing those subjects to be the basis of intelligent practice. He had developed a native talent for drawing to great facility in medical illustration and had already begun the collection of drawings of specimens obtained at autopsy that were to be used in his own books later on. He proposed as his own goal to be a highly competent internist, with special interest and skill in the field of cardiovascular disease, and he set out to train himself to be the kind of person he wanted to be. First, he took a dressership at St. Bartholomew's Hospital because he was convinced by his own observations that medical people did not know enough about surgery. This was followed by a year in Paris in the exciting atmosphere of the great French clinical school. He reached Paris in 1826. Laennec had just died (of tuberculosis), but Chomel was professor of clinical medicine at La Charité, and working with him were Andral, Louis and other stimulating teachers. Hope spent a month acquiring facility in speaking and understanding French and then went to work in ward and autopsy room. He labored not only to learn and to understand but also to perfect himself in the newer technics of physical diagnosis. No doubt some of his colleagues thought his diligence wasted, since many of these technics were so new that there was no general agreement about their future importance in the practice of medicine. After this year of rich clinical experience in France, he worked systematically for another year in the hospitals of Italy, Bavaria and Holland. At twenty-seven he was, as he had set out to be, a well trained internist with a broad clinical experience and with a special competence in the field of his interest. He knew the literature, he knew the men, he knew the subject. He was skilled in the technical aspects of the field and had had some exposure to the methods of thought and the methods of procedure of experimental medicine. He began his practice. At thirty he published a treatise entitled "The Diseases of the Heart and Great Vessels" — a book that Dr. Herrick, in his short *History of Cardiology*, says, "Outclassed all other books on the subject that had then been published." Dr. Herrick goes on to say further:

> Hope struck a new note in the literature of heart disease. His volume has a modern ring to it. His discussion of the anatomy and physiology of the heart, heart murmurs and other physical signs is thorough and scientific with conclusions drawn from a study of the writings of others, as well as from his own experimental and clinical observations.

Hope's book had a deserved success. He influenced the practice of medicine in England, in Continental Europe and in America. My conclusion is that in spite of his untimely death from tuberculosis at the age of forty James Hope made important contributions to our knowledge of medicine and to its translation into practice. I do not suggest that he be taken as a complete model for young men in medicine. He was able and useful, but he had defects of character that made his ultimate stature less than it might otherwise have been. He was egocentric, jealous and hypersensitive, and neither generous nor fair in controversy. But in spite of these limitations of character it seems reasonable to conclude that his plan for the advanced training of James Hope was a successful one.

We may ask ourselves, "What is the essence of his plan of graduate education?" It is, I think, quite simple. First, he assumed the responsibility for planning and carrying out the program of his own continuing education. Second, he defined his goal. He drew the specifications of the kind of life he wished to have and the kind of doctor he wished to be. Third, he systematically, patiently and industriously acquired the skills, the knowledge, the judgment based on experience that made it possible for him to be that kind of doctor. In general, that is the way I think advanced training should be managed, with a minimum of specification from schools or boards and with a maximum of individual responsibility.

Participation in Community Services, in the Provision of Medical Care, Prevention of Disease and Education of the Public.

The medical school as compared with other parts of universities stands in a special relation to the larger community. An important part of the teaching in the medical school is carried on by university appointees working in hospitals and by the participation of both teachers and students in the actual work of community service institutions, such as hospitals. As a part of its university function, therefore, the medical school actually takes part in the provision of community service. In the provision of such service, university personnel and university organization have certain special obligations. One is to see that the community services in which the university participates attain a quality that the university is willing to see accepted as an example of standards of performance that medical students may follow. In medical care, for example, medical-school teachers must set an example not only of technical competence but also of humanity, of the treatment of the whole person, of the utilization of community resources, of the recognition of environmental factors and of all the varieties of professional responsibility. When such an example is set, the medical school is serving the cause of education, is assisting the hospitals and is helping the community.

Recruitment and Selection of Medical Personnel

So far we have considered the objectives of the medical school as they relate to the basic instruction of prospective physicians, leaders in the medical sciences, teachers and investigators, the responsibilities of the medical schools as centers for the creation of new knowledge and its relation to community activity. There is another responsibility that needs to be discussed and that in some ways is fundamental to all the rest. It is this: in general, medical schools are responsible for the *recruitment* and *selection* of the individuals who will make up the medical profession of the next generation. They play the role of the guardians of the gate, of St. Peter or of Cerberus, according to one's point of view. Obviously, the quality of the group so admitted to the profession depends upon two major factors: first, what individuals apply to medical schools for admission, and, second, what individuals are selected from the applying group?

In the past, most of the thought and time of faculties of medical schools have been concerned with the matter of selection. Perhaps it is now time for the faculties, and indeed for the medical profession, to give consideration to the still broader problem of the factors that attract men to the profession of medicine and those that repel them. These recruitment factors are partly the responsibility of medical schools and partly that of the profession at large. The factors that attract men to medicine include such diverse influences as their interest in science or in human beings, the tradition of their families, the romantic attraction of the profession, the prestige of medicine and its opportunities for service, for research and for a life of dignity and community standing. The factors that repel men from medicine include the cost of education, the ever-increasing prolongation of the training and the uncertainty of the future. It is not always recognized that in a changing world the professions that have a long training period are apt to be at a disadvantage so far as recruitment is concerned because it is so difficult to prophesy what the state of the profession will be when the long training has been achieved. At any rate, a systematic study of the factors that lead men to enter or to refrain from entering medicine is an important job for someone to do in the future.

Selection is a perennial problem. No one is satisfied with the methods, and no experienced person is prepared to suggest the ideal procedure. What is sought here, since we are talking about objectives, is a student body made up of individuals who have the intellectual capacity to deal with the prodigiously complicated and a rapidly changing period of medicine, who have the integrity and moral strength that we call character, and who represent wide varieties of talent and interest so that they can play successful roles in the extraordinarily diverse parts of the medical spectrum. To end up with a superior profession requires a wide variety of superior applicants, skillful admission committees, and *freedom to select the best men.*

The recognition of intellectual superiority is easier by formal tests than judgment of character. So far, selection by formula has not been as successful as a combination of statistical material with the judgment of experienced teachers. As has been repeatedly emphasized, they are being selected for general practice, for highly technical specialties such as ophthalmology, for surgery, for psychiatry, for research in fields as diverse as nuclear physics and the unconscious mind, for teaching, for administration, for careers in the sciences underlying medi-

cine and for fields of the future even the identity of which is as yet unknown. It is a nice assignment, and it does not lend itself to solution by a narrow formula.

William James said something to the effect that there is not much difference between one man and another, but that what difference there is turns out to be very important.

In summary, then, it appears that the objectives of medical schools include the following: the provision of instruction leading to the M.D. degree; the provision of instruction leading to the Ph.D. degree in medical sciences; the prosecution of research over a wide spectrum; the provision of advanced training for practice, for research and for teaching; participation in the community service of hospitals and other institutions of medical service; the recruitment and selection of the medical profession of the future.

* * *

In attacking these objectives, schools need the help, the support, the criticism and the understanding of the medical profession. It is a great and happy privilege to be able thus to present my concepts to this important part of our profession, the Massachusetts Medical Society.

THE EFFECT OF THE RICE DIET ON THE LEVEL OF THE BLOOD PRESSURE IN ESSENTIAL HYPERTENSION*

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INTEREST in the influence of diet on the course of hypertension has existed for at least half a century. In 1904, in France, Ambard and Beaujard[1] advocated the use of a low-salt diet for the treatment of hypertension. In the early 1920's in this country Allen and Sherrill[2] and O'Hare and Walker[3] reported on the use of low-salt diets in hypertension. These workers believed that the effect was produced by restriction of the chloride ion. Addison[4] was among the first to suggest that the sodium ion was the important element, and came to the conclusion that "One has forced on one the concept that the prevalence of arterial hypertension on this continent (North America) is in large part due to potash poor diet and an excess use of salt (sodium chloride) as a condiment and preservative of meat." In 1920 Mosenthal[5] discussed the influence of protein foods on the blood pressure, and concluded that restriction of this dietary component had little or no beneficial effect. In 1929 Berger and Fineberg[6] reported on 13 patients on a low-sodium diet, stating that they failed to see any unquestioned blood-pressure modification that they could attribute to sodium restriction. Interest in the dietary treatment of hypertension lagged until 1944, when Kempner[7] reported on the treatment of kidney disease and hypertensive vascular disease with the rice diet. Since that time there has been a renewal of interest. Many workers,[8-11] believing that the most important factor in the rice diet was the restriction of sodium chloride, have used a very low-sodium diet, which has otherwise met the accepted standards of adequacy in other food essentials (National Research Council standards). Kempner's rice and fruit diet has been said to combine practically all the theories that have been advanced for the dietary treatment of hypertension, being low in sodium (200 mg.), low in protein (20 to 25 gm.), low in fat (5 gm.) and restricting fluid intake to 800 to 1000 cc.

One naturally speculates about the rationale of using such a restrictive diet as Kempner's, which violates the accepted pattern of proper nutrition. Kempner[12] says, in a recent publication, "The treatment of hypertensive vascular disease with the rice diet was suggested by observations made on the protein, fat and carbohydrate metabolism of isolated kidney cells under various pathologic conditions (cell injury and/or changes in pH, sodium bicarbonate concentration, oxygen tension, and metabolizable substrate)." Working with damaged kidney tissue, he was led to consider the kidney as an organ of metabolism[13] as well as an excretory organ. He postulated that pathologic conditions in the kidney lead to changes[14] that may be summarized as follows: certain substances that are normally removed by kidney metabolism may be increased in amount, whereas other substances produced by the kidneys may be decreased in amount. These abnormal substances, which accumulate as a result of disturbed kidney metabolism, may be presumed to be harmful, and to be partially responsible, either directly or indirectly, for the production of hypertensive vascular disease. Kempner suggests, therefore, that the ordinary mixed diet may contain constituents that increase the production of these abnormal substances. By reduction of the elements of the diet that must be metabolized by the kidneys, the production of the abnormal substances is presumably reduced. This reasoning, *a priori*, accepts the renal etiology of hypertension. It is known that Kempner[7] first used

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