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The Orientation of an Undergraduate Medical Curriculum

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THE MEDICAL SCIENCES HAVE UNDERGONE such remarkable changes in content and point of view during the past 30 years that a careful study of some details of this evolution would seem to be a necessary preliminary to discussion of the medical curriculum. Moreover, the extent of these changes is so great that one must be prepared to question the validity of the entire school program, as to both subject matter and arrangement.

Great progress has been made in the basic medical sciences—progress which has required continuous changes in the teaching of these subjects. However, this rapid advance has involved no essential alteration in the nature of their critique or of their general scientific reactions. Such striking changes in methods and tremendous increases in the scope of their work have occurred that new categories seem to have been created, yet the chemist who studied the structure of nucleic acid was in no way different in his intellectual approach from the chemist who today follows the physiological career of tagged elements. A natural evolution of content has taken place, with little change in philosophy.

The same statement cannot be made of internal medicine. Those of us who were graduated 30 years ago were introduced to a field that was more art than science. The transition from chemistry, anatomy, and physiology to clinical medicine was sharp and abrupt, and, in addition, there was at times mutual lack of respect between the clinician and the basic scientist. The latter considered diagnosis a guessing game (which it was, in the main), and the clinician had little sympathy with the "impractical" laboratory man. The physician was disdainful of quantitative data and impatient with techniques that could not be carried out at the bedside; even the sphygmomanometer was an unsporting attempt to belittle accurate palpation of the pulse. At its best, clinical medicine was the art of spotting gross pathology before death, or of classifying patients into categories of similarity. Not so long ago we derived complete satisfaction from foot-of-the-bed impressions, lumps, and pulsations, while physics and chemistry played a very small role in a feat that was largely labeling.

In the intervening years internal medicine has undergone a revolution—it is truly more than evolution. Its philosophy is now that of a science, and the art of practice is no longer its primary preoccupation. The well-defined contrast between the intellectual approach found in the basic sciences and in internal medicine no longer exists, for the latter is now an independent science with its own field and its own special applications of physics, chemistry, mathematics, psychology, and, of course, the basic medical sciences. The goal of the modern internist is analysis and evaluation of many and varied dynamic forces. Data illuminating the component mechanisms are derived from the life history of the patient, his physical examination, and a series of quantitative and qualitative technical studies. The physician is no longer competent merely on the basis of his familiarity with certain gross patterns of disease; he must understand the mechanisms by which normal functions become perverted in a single individual, and he must have a fair degree of appreciation of the techniques by which these functions are studied. This understanding and appreciation derive so largely from the basic medical sciences that these subjects play a very practical role in the daily study and treatment of patients. The basic sciences should therefore be presented to the student from the beginning in a way that integrates with clinical medicine, thus avoiding any sharp transition between the two areas. Moreover, there now exist no genuine differences in scientific approach that would act as a barrier to such an integration.

The foregoing statements present facts that are common knowledge and that have been the basis for many successful attempts at correlation between the first two years and the clinical fields. However, there are further implications which apply particularly to the organization of the work within the first two years, as well as to its relationship with the later phases of the student's education.

As has been noted above, the modern clinician is

less concerned with cataloguing than with appraising his patient. He studies the various dynamic units of the individual: his respiratory, cardiovascular, or gastrointestinal apparatus. He then attempts to assemble these component mechanisms into a total functioning organism and, from this total understanding, to give balanced advice. He studies not the anatomy, chemistry, or physiology of his patient but the respiratory function (for example) based on knowledge derived from these fields as they apply to ventilation, diffusion, and aeration. Hence, it is an arguable thesis that early in his career, perhaps even from the beginning, the student should be taught in terms of these dynamic units rather than by academic departments. This increasingly current point of view is in no sense an attack on the present academic organization but simply a plea for the same flexibility in planning the curriculum that is permitted to each department in planning its own investigative program. In fact, investigative interest has broken down departmental barriers to a marked degree, and research problems are chosen quite independently of the name over the laboratory door. It is perhaps pertinent to note that certain departments have pooled both the staff and apparatus concerned in the use of complicated physical or chemical techniques in an effort to obtain more efficient results at smaller cost in men and money. Moreover, successful cooperative teaching programs involving two or more fundamental departments exist at the present time, and further coordination is indicated. Yet, in spite of this cooperation, the student reaches the medical wards without a clearly organized understanding of the units which he must evaluate as a preliminary step to the total appraisal of his patient.

In view of all these evidences of common interest and valuable cooperation, it should be a small step further to organize a major part of the teaching program on the framework of dynamic units rather than by historical departmental tradition. It would seem fruitful to mobilize all fields to the discussion of a given area or a particular mechanism, covering its anatomy, physiology, biochemistry, pharmacology, and finally its pathological disturbances in man. Men, apparatus, and materials pertinent to the unit under discussion could be drawn from any part of the school where they were best available. The men working on water and electrolyte equilibriums, for example, would come together to teach this subject as no one else could, and the clinical investigators pursuing the same interests could participate not only by giving time to routine teaching but also by demonstrating some of the natural experiments that disease so frequently conducts.

The gist of this program is, in summary, a brief introductory period devoted to cellular structure and general physiology, accompanied by a quick, gross dissection, this period being followed by the organization of most of the teaching into groups dealing with dynamic units, vertically, rather than departments, horizontally. The selection of these units and the relative emphasis on each would be guided in part by the requirements of the newly emerged science of internal medicine as it endeavors to analyze and appraise the individual as a whole. This memorandum does not suggest that a doctrinaire and rigid imposition of the dynamic unit is necessary or even advisable. It should not, and probably could not, be applied with abject consistency, but it should be the dominant guiding principle for the basic organization. It would be unwise to require strict compartmentalization of the various units. There would be much overlapping which could in many ways be a teaching asset.

The purposes of the modern medical curriculum should be considered quite as critically as its structure. The great changes in the content of the basic disciplines and in the scientific approach of clinical medicine demand an almost complete revision of the historical aims of undergraduate medical education. Only relatively recently has the realization been forced upon medical schools that it is impossible to expect a student at graduation to be an adequate practitioner of medicine. At one time clinical techniques were so crude and the stores of knowledge so limited that a veneer of the art made it possible for young men to go immediately from their M.D.'s to their shingles.

Since we can no longer impart enough facts during his undergraduate career to carry a man into the role of a safe practitioner, it should be one of our aims to train the student in finding the data that will still be missing from his memory when he graduates. He must know, for example, what books and journals to buy, how to use a library, and where to find original source material. He must learn to recognize when he has reached the limit of his own capacity, so that he seeks help when it is needed.

The young physician must be so prepared while in medical school that he may be able while in practice to keep pace with the rapid advances in the science of medicine that are certain to occur after he is graduated. A primary goal of medical education, therefore, is the development of scientific critique. Success in this direction will enable the physician out of contact with his university to evaluate current contributions to his field and thus to continue his education indefinitely. Stimulation of critique is probably best accomplished by supervised research or, in the absence of this privilege, the exposure of the student to investigators actively at work in the fields which they are teaching. One of the most serious deficiencies of

our students is their lack of interest in research. Not only should the curriculum allow time for such work but the teaching staff should encourage the desire to engage in it.

A still more important job for the faculty of medical schools lies in another direction. The greatest need of the student of medicine is the capacity to analyze the material which modern scientific methods so richly place at his disposal. The student often shows little sense of relative values and poor appreciation of the admissibility of a fact as evidence; for example, a finding equally compatible with a dozen diagnoses is adduced as specific evidence for one. Complicated statistical studies are not being promulgated at the moment; this plea is merely for simple logic, for an orderly intellectual approach. The student must learn how to select his facts properly and from them to build up a tenable hypothesis or else to recognize that the data are insufficient for such a step. He must assess the various components and integrate them into a mechanism that is rarely static. He must seek to determine direction and velocity whenever it is possible. Every phenomenon that he observes should leave him unsatisfied until he has learned its meaning. He must have scientific drive as well as scientific critique. The capacity to analyze data and then to integrate them into a dynamic mechanism is the basic qualification of a competent clinician. The example set by the physicist as he determines the resultant motion of a body by analyzing the magnitude and angle of incidence of the forces acting upon it is the proper pattern for the physician to emulate as he studies a diseased individual.

While it is a fairly acceptable conclusion that the early introduction of the undergraduate medical student to the dynamic units of the human organism would be a profitable method of teaching, it may be less obvious that the general aims of modern medical education would also be better served. However, that position can be effectively supported. Such a curriculum would insure contact between students and research workers in the various teaching areas, and it would offer the minimum of facts without meaning, of structure without dynamics, of function without the stimulus of recognition of its eventual value to the physician. The recommended type of teaching schedule would give more opportunity to teach the philosophy and techniques of pure science because of the constant necessity of dealing in the relationship of experimental observations to deductions concerning an ultimate pattern. It should more successfully cultivate the capacity to assess and to synthesize without in any way curtailing the indoctrination of important basic knowledge.

That phase of medical education concerned with the indoctrination of basic facts should also be reviewed, for the nature and content of the material which the student must carry away in his memory is now vastly different than it was when the present curriculum was devised. This difference is most apparent in the field of anatomy. It should be gratefully remembered that anatomy was the science which rescued medicine from witchcraft, and it is undeniably true that the modern teaching of anatomy is preoccupied with function as never before. Nevertheless, it would be little less than negligent if an examination of the present preponderance of gross anatomy were avoided in the course of this discussion. In determining the apportionment of time to gross anatomy one must note that this subject is the most conveniently restored to memory because of many beautifully illustrated textbooks that are still accurate decades after publication. The student should be familiar with these sources, but their contents need not crowd his memory. Moreover, our understanding of structure has in most instances reached a point where future advances will add a negligible increment. In contrast, a physiological or medical textbook is out of date almost before it can be published. More undergraduate time should be spent in fields where reference is less easy and the pace of progress more rapid.

A rapid orientation dissection in the first two or three months of the freshman year should properly initiate the student into this subject. Further teaching of structure should be distributed in two directions: (1) to the dynamic units, e.g. lungs under respiratory apparatus; and (2) to the specialties: bones to orthopedics, pelvis to obstetrics and gynecology, eye to ophthalmology, etc. The total actual hours of anatomy would certainly satisfy the State Boards of Examiners.

Another area that should be examined as to its relative value in a modern curriculum is pathology. Here again we find the disparity between teaching content and investigative interest that is observed to a greater degree in anatomy. It is perhaps possible to suggest that less time be spent on structural pathology in order to free the pathologist for participation in the dynamic-unit teaching most suited to his genuine interests. It is not a denial of the real importance of pathological anatomy to point out the steady diminution in its *relative* participation in the understanding of disease. An appreciable percentage of the material now taught in general pathology could be applied with advantage to the exposition of some of the dynamic units. It must be emphasized again that this memorandum deals exclusively with undergraduate teaching and is not concerned with the investigative interests or internal organization of any academic department. It cannot be denied that the teaching prob-

lem is a common faculty responsibility and that the final product is a Doctor of Medicine; hence, the ultimate test of any part of the teaching program is its relative contribution to this goal.

While discussing the content of various courses, one more comment may be offered. Since the student reaches his clinical years with an apparent lack of information about psychology, it is tentatively suggested that psychodynamics receive more attention. While it is true that this discipline is handicapped by its inherent difficulties in relation to research, much is known concerning the mechanisms of the emotions in man that could be taught if more time were offered. Moreover, the experimental neuroses in animals might provide a laboratory approach. It may be banal, but it is true, that the general practitioner or internist can help more people psychologically than he can somatically. Psychodynamics should constitute one of the important dynamic units.

A member of the surgical staff has contributed the following statement concerning the bearing of this memorandum on his department:

The chief function of undergraduate surgical teaching should be to assist in correlating the study of disease ordinarily seen and handled by surgeons with fundamental medical principles. The instruction given students by surgery should simplify their knowledge of and understanding of disease; it should not be concerned with the major techniques of therapy. The curriculum should encourage closer liaison between the surgical teacher and those in other clinical fields as well as in the basic medical sciences.

This memorandum has discussed in more or less general terms the structure, the purposes, and the content of the curriculum. To develop detailed schedules would require the thoughtful consideration of a group which should include representatives from all major departments. These men must be genuinely interested in pedagogic problems and willing to make the many concessions necessary if a workable program is to be developed. In fact, it might be wise to set up within the faculty a permanent Teaching Commission or Authority, to which would be delegated not only the future planning but the present management of the over-all teaching program. The purposes of this primary function of a medical school can be best defined and executed by a continuously functioning group independent of academic departments and routine university problems.

International Conference on Magnetism Strasbourg, 21-24 May 1939

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THIS CONFERENCE WAS ORGANIZED under the presidency of the eminent Pierre Weiss by the International Institute of Intellectual Cooperation and the French National Center of Scientific Research, in cooperation with the University of Strasbourg, whose Institute of Physics Prof. Weiss and his collaborators had made the world's chief center of magnetic research. Distribution of the proceedings[1] was long prevented by the German occupation and became possible only a short time ago.

The number of reports was restricted to 18, all dealing with important current work by the reporters and their collaborators, and some containing also authoritative and useful summaries of earlier work. The reports were mimeographed and distributed to the participants for reading in advance of the meeting. Thus, in general, only brief introductions on the part of reporters were necessary, and practically the whole time of the six scientific sessions of approximately three hours each was devoted to the discussions. In these, in addition to the reporters, an approximately equal number of other experts participated.

The complete proceedings constitute a most authoritative and useful guide to any who desire to undertake researches in this field.

After an informal gathering on 21 May, the formal meetings began on 22 May with a general session presided over by A. Terracher, the distinguished rector of the University and of the Academy of Strasbourg, who gave the address of welcome. There were also brief addresses by H. Bonnet, director of the International Institute; P. Montel, counselor of the National Center; H. Abraham, secretary-general of the International Union of Pure and Applied Physics; H. A. Kramers, scientific representative of the Inter-

[1] *Le magnétisme.* Vol. I: *Généralités et magnéto-optique* (pp. xxxviii + 184); Vol. II: *Ferromagnétisme* (pp. vi + 280); Vol. III: *Paramagnétisme* (pp. vi + 348). Paris: Collection Scientifique, Institut International de Coopération Intellectuelle, 1940. Handled in America by the Columbia University Press. Vol. I, $2.00; Vols. II and III, $2.50 each.