SCIENCE

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MEDICAL EDUCATION IN THE UNITED STATES.*

ONE of the chief objects of the organization of the American Medical Association was the elevation of the standard of medical education in the United States. In the president's address, the Father of the Association, Dr. N. S. Davis, stated that 'the purpose of the organization was the improvement of our system of medical education and the direct advancement of medical science and practice.'† That medical education in that day was defective, as recognized by the founders of the Association, is shown by the report of the Committee on Medical Education in the year 1850. The committee said, in part, as follows: "Medical education is defective because there are too many medical schools; the teachers are too few. There are too many students. The quantity of medicine taught is too limited; the quality too superficial, and the mode of bestowal of the honors of medicine too profuse and too unrestricted."

* President's address, delivered at the fifty-fourth annual session of the American Medical Association, at New Orleans, May 5–8, 1903.

† Transactions A. M. A., Vol. XVI., 1865.

For many years the association showed its interest in and attempted to influence the elevation of the standard of medical education through a committee on medical education. The 'Transactions' of the association of the earlier years show many reports of this committee, which display much thought and effort on the part of the association to improve the status of medical education at that period of time. James R. Wood, as chairman of the committee, in the year 1858, recommended that the various medical colleges of America be requested to send delegates to a convention of medical colleges, to consider the matter of medical education. This movement finally resulted in the formation of the Association of American Medical Colleges, which thereafter represented, to a degree at least, the American Medical Association in its efforts to improve medical education. Later, the Southern Medical College Association was formed. Together these associations represent about 80 per cent. of the regular medical schools of the country, and these colleges have, in a general way at least, fulfilled the minimum requirements prescribed by the rules of the associations in regard to the preliminary education of students, the length of the college course, and the character of the curriculum.

About twenty-five years ago the Illinois State Board of Health, through the splendid efforts of Dr. J. H. Rauch, its secretary, made a report on the number and character of the medical schools of the country. This board adopted a minimum of requirements of medical schools as a necessary step toward the recognition of their diplomas by the State Board of Health of Illinois. This minimum requirement of the State Board of Health was gradually increased from time, with the result that many of the medical schools were obliged to raise the standard of medical education to enable their graduates to obtain licenses to practice in Illinois. Other states followed Illinois in requirements for better methods of medical education, with the result that the standard of education in the country was very much improved.

MEDICAL SCHOOLS OF THE COUNTRY.

In the earlier days of our country, the need of physicians was met by the organization of medical schools which were, as a rule, proprietary in character. These schools attempted the education of physicians on the then existing conditions of medicine by teaching in a didactic way the principles and theories of medicine and surgery. The branches usually taught at that time consisted of anatomy, physiology, chemistry, materia medica, obstetrics, the practice of medicine and of surgery. But little opportunity was offered in the great majority of the schools for extensive, practical teaching in anatomy or chemistry, and but a moderate amount of clinical work in the so-called practical chairs. The course of medicine in the college consisted of two annual sessions of four or five months. The course was not graded. The student attended all the lectures and clinics taught during his first year, and the second year was a repetition of the first. This class of schools was rapidly increased in the course of time. The chief reasons therefor were the fact that it was recognized that a connection with a medical school was profitable, directly and indirectly. The prestige which the teacher enjoyed among the graduates and the laity brought him a remunerative consultation and private practice. In most of the states it was easy to incorporate and obtain a charter for a medical college. It cost comparatively little to conduct and maintain the institution. Lecture rooms were obtained at trifling cost. The dissecting room was not worthy of the name of a laboratory, and the chief

expense in maintaining it was the cost of dissecting material, which was usually deficient in quantity and poor in quality. Medical schools were organized all over the country, without reference to the needs of the people. Medical education was prostituted. To obtain a sufficient number of students many institutions showed a most degraded disregard of the moral and mental qualifications of the matriculates. The income of the school was wholly derived from the tuition of students, and no applicant was turned away who had the cash with which to pay his way. To add to the facility of obtaining a medical college course, there were organized in some cities evening schools, the hours of college attendance occurring from 7 to 9 or 10 o'clock at night. These sundown institutions enabled the clerk, the street-car conductor, the janitor and others employed during the day to obtain a medical degree.

In spite of the general tendency to increase the facility by which a medical degree could be obtained, there was a force at work to improve the methods of medical education. A few older medical colleges and an occasional new one set the standard high in relation to the existing status of medicine. There were earnest, forceful medical men in some of the schools who fought for a higher standard for matriculation and graduation.

The medical college associations exerted a splendid moral influence for good, and the state boards in all the more advanced states have, by mandatory legislation, compelled the colleges to raise the requirements in reference to the preliminary education, the length of the annual session, the time of medical college study, the character of the curriculum, etc. As a result, the status of medical college education has been very much improved in the last twenty, and chiefly in the last ten years. But, improved as it is, there are evils which menace us, the chief of which still are too many medical schools, too many students, and inadequate facilities for the proper teaching of medicine.

The improvement in medical college requirements has increased the cost of the maintenance of the medical college to a degree that it is no longer a profitable financial venture. There can be no dividends. Indeed, the proprietors of the private institution must often make up a deficiency in the annual budget. In spite of this fact, medical colleges have continued to increase steadily.

In 1877 there were sixty-five medical schools in the United States. In 1882 this number had increased to 89, and 1901–2 to 156. The enrollment of students and the number of graduates have also increased, in spite of the fact that the requirements for matriculation and graduation have been increased. In 1882 there were* 14,934 matriculates, and this number was increased in 1901 to 26,417, and in 1902 to 27,501, an increase of about 100 per cent. in twenty years.

The number of graduates in 1882 was 4,115; in 1901, 5,444; in 1902, 5,002, an increase of about 25 per cent. in twenty years. If, in 1850, there were too many medical schools and too many students, what can we say of the condition to-day?

It has been estimated that there is an average of one physician to 600 of the population of the United States at the present time. The natural increase in the population of the country, and the deaths in the ranks of the profession, make room each year for about 3,000 physicians, based on the proportion of one physician to 600 of the population. With 5,000 or more graduates each year, a surplus of 2,000 physicians is thrown on the profession,

* *The Journal A. M. A.*, Vol. XXXIX., No. 10, p. 574.

overcrowding it, and steadily reducing the opportunities of those already in the profession to acquire a livelihood. The evil of an overcrowded profession is a sufficient cause of complaint, but the cause thereof is the important point for us to consider and, if possible, remove. To correct the evil, the ease and facility with which a medical degree may be secured in this country must be diminished. As before stated, there are now 156 medical schools in this country. Of these, 30 are sectarian, and 136 are so-called regular schools. Fifty-eight are medical departments of universities, of which twenty-four are state institutions. The relation of the medical school to the university in most instances is a nominal one only. In but few of them is the control of the faculty, or the finances of the medical department, vested in the university proper. In a very few of them the sciences fundamental to medicine are taught in the university. In the majority of these schools these departments are duplicated in the medical department, and are taught by members of the medical faculty. In most instances, too, the teachers of the fundamental branches are physicians who devote but a part of their time to teaching. They teach without a salary, or for a nominal one only. Their remuneration is obtained by private practice, to which they must devote their best energies, to the detriment of their value as teachers. The clinical department of these schools is, in most instances, wholly inadequate. The majority of such schools depend on the general hospitals situated near them for the privilege of the use of clinical material. Necessarily, these clinical advantages have great limitations, inasmuch as they can not be fully controlled for the purpose of proper bed-side teaching, or for scientific investigation. Some of the medical schools which are connected with state universities are situated in small cities where it is impossible to command an adequate amount or variety of clinical material. The connection with a university, which many of the schools enjoy, is, therefore, almost valueless in a pedagogic sense. The majority do not differ materially from the private or proprietary schools in their value as teaching institutions. Ninety-eight of the medical schools in the country are private corporations, organized, maintained and, as a rule, owned by the faculty. If, in earlier years, these institutions were sources of direct financial profit to the owners, they have ceased to be so now—at least most of them. The evolution of medicine has made it necessary to extend the laboratory method of teaching. As these schools attempt to teach the whole curriculum, the erection, equipment and maintenance of the necessary laboratories have so increased the cost of conducting the schools that they are usually no longer self-supporting. The temptation is in such schools to conduct them on a plane which shall just comply with the minimum requirements of the various state bodies, which regulate medical practice in the several states. They are maintained ostensibly to teach medicine, but in reality for the prestige which a professorship affords the teacher in his private and consultation practice. Proprietary schools depend on general hospitals and dispensaries for clinical material. What was said of the status of clinical teaching of the medical departments of the universities is true also of the proprietary college. These schools can not hope to improve their present standards. The majority attempt to maintain laboratories and other expensive means of teaching which a modern medical education demands. But in how many are the laboratories worthy of the name? What kind and variety of instruments and apparatus do

they afford? Are their teachers of the sciences of the fundamentals of medicine capable? They can not hope for better conditions, because the time when a student's tuition will pay the school for his instruction, if he is properly taught, will never return. Medical education of the future must be based on the status of medical science. That basis is recognized now, but is attempted in the great majority of our medical institutions in a very superficial way.

SCIENTIFIC MEDICINE.

The great and important discoveries of Pasteur and the practical methods devised by Koch in bacteriology marked a new era in medicine. Before the facts made clear by these discoveries, the hypotheses and theories of other days have disappeared. Our knowledge of man and the lower animals and of the diseases and evils which afflict them has been revolutionized within the last twenty years. The advance in medical knowledge has been greater in that period than in all preceding time. Medicine now embraces many more subjects, chiefly fundamental ones, than were known twenty years ago. Formerly a very superficial knowledge of a few isolated facts in general chemistry and human physiology and a memorized knowledge of human anatomy and of materia medica enabled the student to learn the practice of the art of medicine and surgery. Now, the problems which confront the clinician and investigator in medicine and surgery compel him to have a good and working knowledge of general, physical and physiologic chemistry, of general biology, bacteriology, pathology, physiology, embryology, pharmacology, histology and anatomy. The physician who has not a practical knowledge of these fundamental subjects can not clearly understand the methods of others engaged in scientific investigation, nor can he rationally utilize the discoveries of others in his work. Medicine to-day is applied science. If we utilize the knowledge of to-day in an attempt to cure and prevent disease, it must also be an experimental science. No one can practically apply or rationally experiment with what he does not know. The fundamental studies of medicine must, therefore, be acquired by all who desire to successfully apply them as sciences. The successful experimental application of these sciences has given us within ten years a knowledge of the method by which the invading bacteria affect the host, and has likewise developed a principle of wide application as a preventive and cure of certain diseases by the use of antitoxic sera. It has confirmed the principle of preventive inoculation, accidentally discovered by Jenner, and has enabled us to apply the principle in other diseases than smallpox. It has enabled us to know the methods of transmission of certain infectious diseases, and to know how to stamp out scourges like yellow fever, the plague and malaria.

Through the evolution of Listerism, it has enabled the surgeon to invade every region of the animal body, and to save scores of lives formerly doomed to death. The freedom with which the surgeon may now operate has not only saved lives, but, indirectly, the knowledge of disease processes so studied during life has taught us many new facts in symptomatology, and has cleared away many fallacies concerning pathologic processes. It has given us many new methods of clinical study, and furnished data from the blood, the spinal fluid, the exudates, the sputa, the sweat, the feces, and urine, which enable us to recognize disease much more readily than before.

Much as has been accomplished by experimental medicine in a comparatively brief period of time, there are vast fields to which the method has not been applied.

With most of us, our present methods of clinical observation enable us to do little more than name the disease. In the vast majority of the infectious diseases we are helpless to apply a specific cure. Drugs, with the exception of quinin in malaria, and mercury in syphilis, are valueless as cures. The prevention and cure of most of the infectious diseases is a problem which scientific medicine must solve. What is true of the infectious diseases is also true of the affliction of mankind due to chemical influences within the body. We know but little of diabetes, of the primary blood diseases, or of the various degenerative processes of age and disease. We hopefully look to chemistry to reveal to us the cause of these and other conditions. Experimental medicine must be the means of removing the ignorance which still embraces so many of the maladies which afflict mankind. Not every student, nor every physician, can become an experimenter in applied medicine. Nevertheless, every physician must be so educated that he may intelligently apply the knowledge furnished him by experimental medicine in the cure of such diseases as can be cured. He will no longer juggle with the life of his patient by an attempt to cure with drugs or otherwise, where no help is possible.

METHODS OF MEDICAL EDUCATION.

The phenomenal evolution of medicine has multiplied the subjects of medical study. The character of these sciences requires that they shall be taught by the laboratory method. The laboratory method, too, has been adopted as the chief method of instruction in anatomy, pharmacology and chemistry, formerly almost wholly taught in medical schools by didactic lectures. The laboratory method, while necessary to the proper and practical instruction of the student, involves an expense which is appalling when compared with the methods of teaching formerly practiced in all schools, and still adhered to in many medical schools. The method is expensive, inasmuch as it involves more extensive buildings, much expensive apparatus and an increase of the teaching force. The instruction must be individual or to small groups of laboratory workers, and this involves also an extension of the time of instruction. A physician engaged in private practice can not possess and retain the general and technical knowledge necessary to enable him to teach one of the fundamental sciences properly, nor can he devote an adequate amount of time to it. The teachers of these fundamentals must be investigators in the province of their respective sciences. They must give their whole time to the instruction of students and to original investigation. The thoroughness and accuracy of the training of the special senses, and in experimenting, which a student will receive from such teachers in properly equipped laboratories, will make him keen in intellect and sound in judgment. His desire for knowledge will be stimulated by the atmosphere of his surroundings, and will awaken in him a consciousness that through him and his work the knowledge of the world will be increased and humanity benefited thereby. But teachers of this character must be paid salaries quite as large as the remuneration of professors in the departments of arts, literature and science. The salaries of such professors and of the corps of assistants which the laboratory method implies make the cost of the university or college far beyond the income which could be derived from the tuition of students. I believe it has been estimated that the laboratory method of instruction, now followed by all first-class institutions of learning, costs annually from $400 to $500 per student. But, great as the cost seems, it must

be conceded that the present status of medicine demands the thorough instruction of students in these fundamental studies. It matters not whether his future may be that of a teacher or a practitioner of medicine. In either event, he must apply his knowledge of the fundamental sciences to his work, and the result will depend on the thoroughness of his education.

APPLIED MEDICINE AND SURGERY.

To enable the student to utilize the knowledge of a thorough training in anatomy, physiology, chemistry, pharmacology, physiologic and physical chemistry, embryology, neurology and pathology, he should be afforded facilities of equal rank in clinical medicine and surgery. To supply the student with proper clinical facilities involves several important features. Special hospitals, which would be absolutely under the control of the medical school, would be necessary. The hospital should be constructed with a definite idea of teaching students and of making researches into the nature, causes and treatment of disease, as well as to care for a definite number of patients. Hospitals for general medicine, surgery and obstetrics would be essential. Such hospitals, with laboratories and equipped with instruments, apparatus and library, would cost for their building and maintenance a very large sum of money. With such hospitals it would be necessary to choose the professors of medicine, of surgery and of obstetrics, with competent assistants, of the same type as the teacher of the fundamental sciences. They should give their whole time to the work of teaching and to original research in the hospital. They should be men who have proved their scientific fitness for the important positions by the contributions they have made to medical knowledge. They should rank with and receive the pay given to professors of important departments in arts, philosophy and science. When so paid, they would be free to devote all their energy to teaching, and to experimental medicine—a career which would enable one to be of the greatest possible service to mankind. No life's work could be fuller or of greater self-satisfaction, and surely none would be more honorable. From these teachers and investigators the student would obtain instruction of the same systematic methods of accurate observation and investigation which are employed in the fundamental branches. He would receive thorough, conscientious drill in the fundamental methods of examination of patients, and his knowledge of the fundamental sciences would be constantly applied in this work. The trained clinical teachers would direct the student in thorough, careful observation in the wards and at the operating table, would collect data to be submitted to experimental tests, and would conscientiously carry out the experiments in the laboratories of the hospital.

The brilliant discoveries which have made our knowledge of the cause and means of transmission of many of the infectious diseases have been chiefly due to the introduction of the experimental method of investigation. Teachers and investigators of the type mentioned will have the opportunity to make equally important discoveries in the broad field of the unknown in medicine. They will train students in the methods of research work and constantly increase the number of investigators in the domain of medicine. And there is need for such men. We may give the great practitioners who have taught clinical medicine their due meed of credit for their excellent, painstaking, unselfish efforts as teachers. They have added to the sum total of our clinical data, have utilized the knowledge of the pathologist and the physi-

ologist in diagnosis, and have tested and judged the worth of therapeutic aids in the treatment of disease. But as teachers they have not made students investigators or experimenters. Not one of the recent great discoveries in medicine has been made by such a man. He has used as clinical material hundreds of cases of pneumonia, rheumatic fever, tuberculosis and chronic diseases by the score; his experience has taught him to recognize these diseases, even when the clinical manifestations are obscure, but he is no more successful than when he began to practice in saving the life of the patient with pneumonia, in preventing endocarditis in rheumatism, in curing tuberculosis, or in checking the advance of a chronic hepatitis. It is time, therefore, that the clinical teacher should have the knowledge necessary to carry on experimental investigation, with hospital facilities for the work that the profession may become purged of the shame of helplessness in curing so many of the common diseases of mankind.

The patients who will be received in these hospitals will be fortunate. They will receive the most painstaking examination and study, and the experiments made on animals in the laboratory will benefit the patients directly, inasmuch as more rational therapeutic measures will be applied in cases so investigated. In addition to the clinical teachers, who will devote all their time to teaching and research work in the special hospitals, there will be quite as much need for the clinical teacher, who is in private practice, in the general hospitals. Under his direction the student may himself investigate a hospital or ambulatory case, and undertake the care of the patient. His rich and varied experience in hospital and private practice will enable him to round out the student's college education. He will impart to the student a better idea of medicine as a whole. He will coordinate and arrange the isolated facts of clinical and laboratory investigation, and give them their true and relative value. He will teach the student the art of medicine; he will teach him that human sympathy and encouragement of the sick and dying are a part of his duty as a physician.

It would be most practical to make the clinical work of the third year a clinical drill and experimental course, given in the special hospitals, and assign the students of the fourth year to the general hospitals and to the clinical teachers who are in private practice. All the general hospitals and dispensaries controlled by the medical schools could be utilized in the fourth year for this purpose, and afford the student an abundance of clinical material and the benefit of the experience of many clinical teachers. Many of the assistants in the special hospitals, of the third year course, would doubtless engage ultimately in private practice, and would, because of their scientific attainments, make excellent clinical teachers in the fourth year. A medical school conducted on the high plane advocated must necessarily be under the control of a university. Such a medical school would cost an enormous amount of money, and this can be commanded only by the trustees of a university of the highest order. That the money for the purpose of establishing and maintaining university medical schools with research hospitals and university clinical courses will be forthcoming can not be doubted. The world is awake to the great discoveries recently made in medicine. The wealthy men of this country have had their interest aroused as never before in reference to the possibilities and benefits which medical investigation will give to mankind. They now recognize that they and all posterity will

be benefited by every new fact discovered in medicine, and that physicians thoroughly and scientifically trained are necessary to conserve the health of the people.

Three years ago Professor W. W. Keen, in his address as president, deplored the fact that medical schools received relatively little aid in the form of endowments as compared with universities and colleges of philosophy, art and theology. Since that time several millions of dollars have been given for medical education and scientific research. The signs of the times point to a brighter future of medicine in America.

EDUCATION PRELIMINARY TO MEDICAL STUDY.

The subject of the educational requirements for matriculation in medical schools has been discussed at many meetings of this Association in its earlier years, and later by the college associations, by the American Academy of Medicine and by the various state boards of health.

The requirements were at first lamentably low, and the efforts of the Committee on Education of the American Medical Association and of the college associations had but little effect, because they possessed no legal power to control the schools.

The influence of the various boards of health of several states, notably Illinois, was more marked, inasmuch as these state boards possessed a mandatory power. The colleges were forced to adopt the minimum educational requirements of the state boards of health if their diplomas were to be recognized by the respective state boards.

These moral and legal influences to improve the preliminary requirements were almost nullified by the practice of a majority of the medical schools in admitting students whose educational status was examined into and judged by a committee of the college faculty.

This practice is still followed by a majority of the medical schools, and results in the admission of many students who are unable to fulfil the prescribed requirements. As a subterfuge, students are often matriculated conditioned in one or even several subjects. Then the student and the faculty committee forget all about the subject, and the student completes his course, goes into practice, and dies with the conditions still undischarged.

The present requirements of the college associations and of the various state medical examining boards and state boards of health amount, on the average, to a high-school education. The curricula and length of course of the high schools of the different states, and even in the same state, differ very substantially. However, if the medical schools now in existence would honestly require as a minimum education the diploma of a high school, without regard to the rank, it would be a marked advance over the present requirements as practiced by most schools.

We must admit, too, that there are medical schools of such low educational grade that they have no right to demand of their matriculates as much even as a common school education. This fact that low-grade medical colleges exist is one of the most satisfactory explanations of the difficulty encountered in elevating the standing of preliminary requirements.

To get at the root of the matter the medical college must be brought up to the proper educational standard, and then, and then only, can be made a proper preliminary educational requirement.

UNIVERSITY MEDICAL COLLEGES.

The present status of medical science requires and demands a university medical college course. By university medical college is meant a medical school which is directly connected with and a part of a university; the university fixing the requirements and controlling the admission of stu-

dents to the medical department. The method of teaching both the fundamental and the clinical branches is on the principles outlined above. To properly prepare for such a course the student should have, as a minimum preparation, at least two years of study in a good college or university. The requirements to enter a good college or university would insure a sufficient knowledge of the ordinary school branches and also Latin or Greek. During the two years' course in college his time would be well spent in the study of English, French, German, mathematics, history, philosophy, physics, chemistry, general and organic, and qualitative analysis, comparative anatomy and general biology. The amount of time to be devoted to each of these subjects would be the same as that of students of general science, as arranged in all college curricula, with the exception of a much more thorough course in chemistry, biology, physics and comparative anatomy.

So prepared, the medical matriculate would be able to grasp all the intricacies of the subjects of the fundamental branches of medicine. With the addition of the full medical college course, as outlined above, his education would be equal in culture to that of the graduate in arts and philosophy. At the same time, it would be practical and especially fit him for his work as a scientific investigator or practitioner, or for both.

With the medical profession so educated a physician would be, in truth, a member of a learned profession. From an educational point of view he would rank as an equal with the scholar in philosophy, law and theology. As a man he would be recognized as the greatest benefactor of mankind.

With the establishment of university medical schools the first two years of work in the medical school will consist of courses in pure science. Then, doubtless, all universities will adopt the plan which two or three universities have already put in practice. That is, that the student who completes the first two years of the science course of a university, or at a college of good standing, may enter the sophomore year of the university and take the first two years' work in medicine, as the sophomore and senior years of the bachelor's course, when he would receive the degree of S.B. The student who completes the three years of the arts or philosophy course at a university, during which he should take a large amount of work in physics, chemistry and biology, could then enter the medical college and after two years receive the degree of A.B. or Ph.B. After two years spent in the clinical school he would receive the degree of M.D.

This telescoping of the literary and medical courses affords the advantage of an economy of time, while it does not in any way lessen the value of the result to the student. In the one case the student secures the degrees of S.B. and M.D. after six years of study, and in the other the degrees of A.B., or Ph.B., and the degree of M.D. at the end of seven years' study.

THE OUTLOOK OF MEDICAL EDUCATION IN THE UNITED STATES.

Medical education must advance to its proper level if it complies with the present status of the medical sciences and the demands which continued evolution in medicine promises.

What does this imply? It means that the private—the proprietary—medical school which is conducted for commercial reasons must go. Acknowledge, as we must, the great value which the best of these schools have been to the profession and to the country, all such schools have

lived past the time when they can be of value. The continuation of these institutions henceforth will be harmful. They can not command the money to build, equip and maintain the laboratories and hospitals which a proper and adequate medical education demands. In the past their graduates have furnished the many great and influential medical and surgical clinicians of this country. In former days a graduate poorly prepared has been able, by indefatigable labor and post-graduate work, to place himself in the front rank as a clinical physician and surgeon.

To-day medical science demands primary instruction to fit a man as an investigator and scientific physician. If not properly educated he can not grasp the great problems which medicine presents to-day as he did the more simple clinical facts which comprised the art of medicine and surgery a few years ago. In the future medicine must be taught in the large universities of the country and in the state universities which are situated in or near large cities, where an abundance of clinical material may be commanded.

The state university and the college which desires to teach medicine, and is so situated that it can not command clinical material, should confine itself to teaching the sciences fundamental to medicine. These should be taught as pure sciences, and should be included in the course for the degree of S.B. A college or state university ambitious to teach the medical sciences can do so without great cost. To attempt to teach applied medicine without proper and adequate hospitals, and with an insufficient number of patients, would be irrational, nor can they command the necessary funds with which to do it. From such colleges and state universities the students could go to the larger institutions which are able to furnish the proper facilities for teaching applied medicine and surgery.

The general hospitals of many of the cities, now used by proprietary schools, could be utilized as clinical schools for both undergraduate and post-graduate teaching, conducted by the clinical teachers in the existing proprietary schools. Indeed, these hospitals could be utilized as university extension clinical courses. Necessarily, they would have to be under the control and direction of a university medical school.

How many schools may be necessary to educate the number of doctors of medicine required annually in the United States? The question one can not answer, but it is safe to say that 2,500 graduates annually will fully supply the demand. This would imply about 10,000 to 12,000 matriculates. A minimum number of twenty-five and a maximum number of thirty-five medical schools should offer sufficient facilities to educate 10,000 students. The various state universities and the colleges which offer adequate science courses would educate a great number of students in the fundamental branches, or in the first two years of the medical course.

MEDICAL RECIPROCITY BETWEEN THE STATES OF THE UNION.

The low requirements of some medical colleges, and the want of uniformity in the requirements for a license to practice in the different states, has resulted in a condition which entails much hardship on a physician who desires to remove from one and to engage in practice in another state. The rules of most state boards of medical examination and of health are so stringent that a physician or surgeon of years of experience and of acknowledged skill and education, and the specialist who may be renowned in his field of work, are obliged, like the recent graduate, to take an exam-

ination in all of the branches of medicine and surgery in order to secure a license to practice in the state of his adoption.

To correct this evil it has been suggested by a member of the American Medical Association, and concurred in by others, that a national board of medical examiners be organized; that the board hold examinations at different seasons of the year in the various large cities, and that the diploma so obtained shall be recognized as a license to practice in any one or all of the states and territories. The measure suggested seems to be practical and feasible.

In addition to this plan, it remains to be said that the degree granted by the future university medical school will be undoubtedly recognized as an evidence of fitness to practice in any state in the Union. When we shall have a less number of schools and annual graduates the various states may safely and rationally become more liberal and discriminating in the conduct of their office.

THE INFLUENCE OF THE AMERICAN MEDICAL ASSOCIATION.

The American Medical Association should maintain its interest in the elevation of the standard of medical education, one of the chief reasons of its organization. Its influence in former years was principally moral. This was of considerable value, for the reason chiefly of the high ideals of the founders and first members of the association, who advocated and fought for a higher standard of medical education. In the future its influence should be many fold that of the past, for with the reorganization of the profession, the better methods of conducting its affairs, the increased and probably very large membership, and its great medical journal, it should wield a great influence for good.

As the direct agent by which the American Medical Association may exert its influence in the elevation and control of medical education, the Committee on Medical Colleges and Medical Education should be made permanent and should be given adequate power and sufficient annual appropriation to make its work effective.

This association should, therefore, stand for, and should use its whole power to improve, medical education in this country. It is said that we never exceed our ideals in practice, and that if we lower our ideals our conduct sinks to a lower level.

The American Medical Association should take as its ideal and standard of medical education the university medical college, with all the name implies in regard to the fundamental medical sciences, and to the clinical branches. It should use its influence to drive out of existence those proprietary medical schools which are conducted solely as money-making institutions. These measures can not be accomplished at once; but medical science demands it, the profession demand it, the people demand it, and look to the American Medical Association as the chief influence which shall accomplish this end.

Frank Billings.
Chicago.

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*THE RARE EARTH CRUSADE; WHAT IT PORTENDS, SCIENTIFICALLY AND TECHNICALLY.**

In the movement of economic and social forces the closed century knew four periods of intensified activity. In 1775, a memorable date in American history, Watt began the manufacture of the steam-engine. During the adolescence of our own country revolutions were wrought in the commercial world by the invention of the locomotive by Trevethick (1801), the loom by Jacquard (1801), and Fulton steamed upon the Seine. By the beginning of the nineteenth century the inventions of Watt and

* A lecture delivered before the Chemists' Club, New York, by request, April 8.