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ADDRESS.

THE EVOLUTION OF MEDICINE AND NEW METHODS OF MEDICAL TEACHING.

An address delivered at the ninth annual opening of the Department of Medicine, University of Minnesota.

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The time was, and but recently, when the history of medicine was regarded as the classic introduction to a text book upon medical practice. It was the subject of a regular course of lectures in many institutions of medical learning and, in some, it was even assigned to the guardianship of a distinct chair. With the rapid growth of the medical sciences and with the multiplication of essential branches of instruction, it has been crowded out of the curriculum. Whether wisely or unwisely, in but a very few schools is its study still maintained.

This is a loss certainly, and one to be deplored, if the student of medicine does not acquire that loving reverence for his calling which will lead him to investigate its past; if he has not sufficient taste for the literature of his profession to win him to make its history a voluntary part of his education.

For this history of medicine—a curious and entertaining story, centering itself in three great facts of character—the passion for self-knowledge, the imminence of human need dependent upon self-ignorance, and the sentiment of human devotion in the sight of suffering, this history of medicine is as complete and chromographic a picture of the evolution of intellect as the records of the race afford.

Deeply into its attractive pages I can not venture this evening, but I commend their study to your leisure hours as a recreation from the more arduous duties of your college course. From this history I desire only to draw sufficient evidence of the fact that the medicine of to-day is the still evolving product of an evolutionary process through which it has passed and still is passing to the position not merely of an art, but of a true science. And, as the first item of this evidence, observe that medicine, in its development, has always been most quickly responsive to the favorable environment of physical integrity. It has always languished in the atmosphere of physical degradation. The worship of the body has been an inspiration to the study of its conditions. The stalwart races have been the leaders in medical lore. The Arabs, the Greeks, the Moors, the Magyars, the Anglo-Saxons and the Teutons have given the world, at once, its best types of physical perfection and its pioneers in the science of medicine.

Again, observe, that the medicine of each period has been in closest harmony with its intellectual sur-

roundings. It has possessed the general qualities of each phase in the evolution of the human mind. And itself a creature of human necessity, it has, in turn, created for itself in the public mind an atmosphere luminous in direct proportion to the measure of its own light. In an age of barbarism we see medicine as a species of savage sorcery and the popular attitude toward it is one of fear. In an age of superstition medicine is the mystery of the alchemist and the popular attitude toward it is that of wonder. In an age of ecclesiastic authority medicine becomes oracular and the popular attitude toward it is one of absolute credulity. In an age of metaphysics medicine is speculative and the popular attitude toward it is that of dogmatism. In an age of experience and superficial observation medicine is empiric and the popular attitude toward it is that which seeks after a sign and demands a specific. In an age of science medicine slowly becomes scientific and the popular attitude toward it is that of scepticism of its traditional formulæ and inquiry into the reasons for its faith.

Only in the perspective of history can we see these periods outlined sufficiently for the recognition of their essential and separate qualities. Since no lines of demarcation lie between them, since insensibly they shade into one another, since the phases of this evolution have not been of coincident development in all communities and through all levels of society, it is not surprising to find the peculiar characteristics of one period invading the next and often exhibiting a remarkable viability. It is one of the difficulties with which the philosophy of evolution has to deal, that while the fittest ultimately survives, the unfit makes a desperate struggle for existence. Thus we find relics of savagery in the torture of the sick, long outliving the advancement of society into semi-civilization. We find the grave cloths of superstition in long-continued use as the swaddling clothes of authoritative medicine. We are not so far removed ourselves from the speculative era but that "isms" and "pathies" still persist, and that "systems" of human cures or "divine healings" still are born and "have their day and cease to be," proving themselves, in their premature decline, to be but the "broken lights" of scientific truth. We are not yet so far beyond the age of empiricism in medicine, but that we feel the force of the dangerous argument from experience alone and that the multitude of us still prescribe remedies which have a mere reputation of cure; which, in the vulgar tongue, are good for the ills which ail our patients. We are not yet so far advanced into the period of scientific medicine that we trace a cause for every pathologic effect, that we demand to know the physiologic action of every therapeutic agent we employ, that we question our daily practice till it gives a satisfactory reason for every custom that we traditionally follow. So great and so widely distributed has been the mass of the

medical profession necessary to meet the growing needs of society that it has sometimes visibly suffered the consequences of its own inertia, rendering it now conservatively slow in response to a moving impulse and again subject to the excesses of its own momental force.

Nevertheless, scientific medicine is, I repeat, the still evolving product of an evolutionary process which has kept proportional pace with the intellectual development of the race.

The evolution of medicine, in common with other subjects of natural development, has not always been a continuous process. Occasionally it has suffered a seeming temporary paralysis, and for almost a generation perhaps no important fact of discovery, no new achievement of practice breaks the dead level along which it drags its indifferent way. But this apparent arrest of progress proves ultimately to be due merely to some obstacle of error which has barred its upward course, before which it pauses until it gathers sufficient energy to roll the barrier from its path or which now and then, perchance, seems to force it back upon itself and start a retrograde movement which leads about in the end to some broader and better way.

And not infrequently does the history of medicine show us that in this, as along other lines of evolutionary force, development has sometimes proceeded by sudden and surprising movements, by the unexpected discovery of some new and widely illuminating truth, by the appearance, as it were, of some massive points of projection in human events or in human life which have given to the few, like Moses, among the mass of men, a glimpse from Pisgah into the land of promise. Some of those events and some of those individuals who form these projection-points in the history of the evolution of medicine have only been justly measured or even tardily recognized by the search light of later development. Born out of time, they were the abortive products of a false generation in the eyes of their contemporaries, but they were the archetypes of a new era in the judgment of the future. Some of them are still unknown, and yet their deeds, which passed unrecognized and are even yet untold, were prophetic of many a modern "new departure." We do not know the names, even, of those obscure professors who conducted a single annual dissection of the human body at Ingolstadt and Heidelberg in the early years of the sixteenth century and who considered it necessary to conduct religious ceremonies after each demonstration before their classes, but it was their spirit which inspired Vesalius, the traveling anatomist of Brussels, and Fallopio of Modena and Eustacchi of Rome, whose discoveries have been christened with and have immortalized their names.

The simple sow-gelder of a German province, who, in 1517, successfully removed the ovaries of his daughter, had little surgical or even veterinary skill to bring to his task, but he deserves recognition, nevertheless, as the nameless author of an operation which has become fashionable, to the weal of many and the woe of some, in these latter days of the nineteenth century.

Small honor in his day was accorded to Felix Platter, who, in 1557, insisted upon the psychic treatment instead of the incarceration of the insane, but he it was who led Pinel, in 1801, to remove the fetters from the demented and to teach that mental disease should be looked upon as a brain lesion.

Prophet he was of a deliverance of the defective classes of society which he anticipated by two centuries and a half of time! Bright projection rising out of the gloom of the professional ignorance of his own times into the clear atmosphere of scientific medicine, his name is deserving of the unconscious worship of the thousands of the hopeless and the helpless who have profited by the evangel he proclaimed!

And among the men whose discoveries have made them famous, many there were "of whom the world was not worthy" and who were compelled to wait upon posterity for the recognition they merited. As we look back upon their history it seems to us that "there were giants in those days," but they were giants only by comparison with the mass of their fellows among whom they stood. They would stand shoulder to shoulder among the scientists of to-day. They were simply great projection points upon the medical progress of their time; men who laid down the new lines along which progress was made, or from which new departures could come. They were not only opportune discoverers, but pioneers, who opened the door to future and sometimes very much postponed research.

When Harvey announced the circulation of the blood in 1628, and Malpighi in 1661, discovered the capillary circulation, the facts were viewed as wonder tales by their associates, and not even the discoverers themselves knew what a wonder-world they had opened up to future investigation. When Haller, in the eighteenth century, laid down the doctrine of the functional irritability of the nerve-tissues, his colleagues received the new theory with mingled curiosity and suspicion, but they did not know that by virtue of that demonstration, Haller was destined to be called, a century later, "the Harvey of the nervous mechanism."

When Bichat conducted his brilliant anatomic dissections a hundred years ago, his contemporaries rightly honored him as being the founder of the study of general anatomy, but they did not recognize in him, also, the founder of realism in his profession; they did not see that his scalpel was uncovering facts that were to be used for the overthrow of speculative medicine; they did not read the prophecy of the coming of clinical and laboratory methods in the teaching of the students of to-day in his pregnant words: "Books are merely the memoranda of facts. We have living books before us in the living and the dead."

When Jenner discovered the principle of vaccination he was like a miner who has stumbled upon an unexpected gem, whose practical value he puts to a sufficient test, but neither he nor the men who long debated the value of the "find," nor the thousands who have since adopted the practice of vaccination and have minimized the terrors of smallpox thereby, could foresee that his virus might prove, in generations to come, to be the type of many antitoxins, the suggestion of a possibly large field of serotherapy, the forerunner of the gospel of preventive medicine, the faint promise of the proof of the doctrine of immunity from disease.

Like all other products of mental evolution, medicine has always been responsive to the influence of two forces, the force of attraction from above, incident to the progress of the related sciences, and the force of propulsion from below, incident to the rise of popular intelligence. With the beginning of the

present century these two forces became active to an extraordinary degree. The energy of general scientific development was strongly nascent in the early years of this period. It burst finally into a flame which has been burning with increasing and unparalleled brilliancy as the century advanced. At the same time were maturing those social and political forces which gave impulse to the magic ideas of Pestalozzi, the father of general education. The intelligence which, in earlier ages, had been the heritage of the high-born, began to penetrate downward and leaven the lower strata of society, until it broke forth again, at all levels, in the energy of a popular demand for knowledge. The influence of this general rise of intelligence upon the education of the so-called learned professions—learned, hitherto, only by comparison with the masses—who can measure?

These twin forces found the profession of medicine steeped in the atmosphere of speculation and apparently unstirred by the touch of that spirit of practical realism which had its birth in the labors of Bichat. But, buried as it was in the schools and systems of speculative thought, it had in it the living germs of scientific development which could not but respond to the quickening influences of the times. Not to attempt a general survey of these influences of nineteenth century science, we may just pause to note, by way of illustration, the wide range and varied character of the attractive forces by the aid of which medicine has been lifted to a scientific plane. It needs but to mention the labors of Schwann and Lamarck and Schleiden in microscopic botany; of Berthollet and Pasteur in chemistry; of Darwin, Haeckel and Wallace in the philosophy of development; of Faraday, Ohm, Ampère, Seebeck, Edison and Bell in electricity; of Malus in polarization; of Kirchhoff in spectrum analysis; of Fox Talbot and others in photography; of Dutochet in physiologic chemistry—it needs but to note the names and works of these to see whence sprang the irresistible influences which are helping to make of medicine a science and which have given birth and opportunity to a generation of medical scientists whose names and number and achievements bid fair to rival in brilliancy those of their fathers in general scientific research.

With the history of these masters in scientific medicine you will become familiar as you profit by the conquests and discoveries they have made. Into this history even of the moderns in medicine it is not a part of my purpose to enter. Suffice it that medicine, through their labors, is a science. It has been difficult for the profession to get away from the speculative tendencies of an earlier day; those hereditary habits still crop out with the persistency of tares among the wheat. It has been difficult to outgrow the love for our traditional position of authority in the community, but the day of the oracular in medicine has gone by; the oracle has been found out and it is works, not words, which can win allegiance from the people of to-day. It has been difficult to abandon the practice of empiricism, to learn that the argument from experience is a most dangerous one in medicine when all its conclusions rest upon a "variable" quantity in the person of the patient. It has been difficult to substitute for these, through the great body of the profession, the exercise of a scientific spirit. Even to-day that spirit moves but feebly in the minds of many. It has not been easy to learn the unaccustomed lesson of putting "the why" before "the there-

fore," of distrusting the effect until the cause is clear, of doubting "symptoms" and seeking "signs," of making conclusion wait upon investigation; of applying to the human body the instruments of demonstration, rather than the intuitions of the doctor; of accepting the verdict of the thermometer, the stethoscope, the battery, the microscope, the chemic reagent, the bacteriologic test, aye, even the knife of the autopsy—the testimony in a word, of eye and ear and touch, rather than the feelings of the patient or the suppositious effects of an empiric formula. The transition period through which medicine has had to pass has been a slow and tedious phase in its evolution; so large a body, of necessity, moves slowly, but nevertheless it moves. No longer the physician is compelled to walk in the half-light of variable experience or in the gloom of metaphysic theories; no longer he treads softly upon the velvet of popular reverence, woven out of his fancied possession of occult truths; he stands out in the light of a new day; his hypotheses are useful but they must be proven; his theories may outrun his practice but they must be supported by facts; he must be able to give to every man the reasons for his faith. For the medicine of to-day is a science.

But, at first, and for a comparatively long period, considering the rapid movement of its later evolution, medicine was, as I have intimated, the science of the masters. Indeed, this perhaps is to be accounted for by the very rapidity of its progress. Only the master-mind, the mind of exceptional opportunities could keep pace with its league-long steps. Slowly the scientific spirit permeated the profession; but old and young were compelled, at first, if they received it at all, to receive it at the feet of some medical Gamaliel. The masters have slowly multiplied, but, until very recently, facts have been acquired of necessity, at second hand; we have learned the scientific methods of medicine by proxy. We of the generation you follow, grew up in a period of pupilage, during which the few were trained in the seats of scientific learning and went out to preach the gospel to the many. Students heard with the ear, but did not see with the eye, the structural secrets of the human body; if they saw, they did not do the experiments which proved the problems they studied or the operations upon which, in practice, they must soon put untrained hands. Their practical work was confined to the use of the scalpel in a single dissection of "an upper" and "a lower," and to the trial of a few chemic reactions in the test-tube for a few short weeks. Occasionally they listened to a clinic talk at the bedside of a typical case, or viewed from the distant benches the white aprons of the surgeons and the instruments in the hands of assistants at the operating table; or, far less often they gathered, with hungry eyes, about the postmortem table in search of a few living facts to be discovered from the dead. Some of these imperfect methods, for want of better, we still pursue. But the age of the masters in medicine, as in other fields, is passing by. A period of individualism in medicine, as in everything else, is upon us. There are not fewer intellectual giants than of old, but the medicine of to-day demands that all its members shall be of larger mold. The many are growing to the stature of the few. Science is becoming more available. Its instruments are more accessible. Its methods are easier of attainment. Its results are more easily measured by improved means. Its adaptations to

daily practice are more numerous and indispensable. Personal practical training is more necessary than of old. Each must do in the medical science of the future, to a very great degree, what any other has done. It is not enough, students in medicine of to-day, that you shall see through others' eyes; you must also see with your own; it is not enough that demonstrations shall be made and tests done for you, you must do them for yourselves; it is not enough that shall know the names of drugs, you must be able to recognize them; you must not only learn their action, but you should *see* it; you must not only be able to tell the constituents of the body fluids and tissues, but you must be able to analyze them; you must not only learn by ear the structural peculiarities of the tissues, you must be able to differentiate lung and liver and nerve tissue, under the microscope; you must not only be able to count a pulse, you must be able to study its qualities; you must not only know the meaning of heart sounds, you must be able to discover them and read them aright; you must not only be able to take temperature, but you must understand its production, its regulation and its means of loss; you must not only understand the principles of dietetics and food-preparation, you should be able to put them into personal practice; you must not only learn the principles of obstetrics, but you must practice them individually under the guidance of your teachers; you must not only witness operations, you must *do* them on the patient or on the cadaver; you must not only know the peculiarities of pathologic products, you must be able to make their differential diagnosis under the glass; you must not only know the names of disease-germs, you must be able to recognize their forms; you must see them not only in the persons of their victims, you must rear them in the culture-tube; you must not only master the details of physical diagnosis, you must be able to apply them to disease at the bedside or in the clinic. The opportunity to accomplish these things is enlarging with every passing year. It is the heritage which the masters of the past have bequeathed to the students of the present.

Ladies and Gentlemen: I have heard these things called the adornments of medical teaching. A student informed me but a few days ago that her preceptor had advised her that these accessories were "nice but not necessary." They *are* embellishments, it is true, of the medical practice of fifteen or twenty years ago, but they constitute the warp and woof of the scientific medicine of to-day. For the attainment of this ideal education, it is necessary for the teacher to come as closely as possible into contact with the individual student. The didactic instruction of large classes is a means of time-saving, but for recitations and reviews, for laboratory exercises, for demonstrations, for purposes of bedside and clinic diagnosis, for obstetric attendance, for the witness or the performance of operations, in short, for all forms of practical work, these classes should be divided into small sections. Upon the adoption of such a recitation system and upon the initiation of such section work in several clinic branches this college is to be congratulated. Its fuller extension to the entire laboratory and clinic system and even to the surgical operating room is to be desired. It is possible for a class of ten or fifteen students to witness an operation with profit, but the hours spent by large crowds of students in a surgical amphitheater are largely wasted and could be spent

by the majority of students more profitably over a text-book descriptive of the operation they are seeking to witness. A multiplication of laboratory assistants and clinic instructors is involved in this plea for a more elaborate system of sectional work; it means a larger equipment and a larger expenditure of material, but its adoption is in the path of progress in our professional schools. As a step in the same satisfactory direction we welcome the partial abandonment of the final examination system and the substitution for it of oral recitations throughout the term and at the close of the college year.

In a word, medical education is to be conducted, so far as possible, in the individual rather than in the mass. It is to be less didactic and more practical. It is to be less in the lecture room and more in the laboratory, in the hospital, in the dispensary and in the clinic. Leaders in medical science, teachers in medical thought there must always be, but each man and woman who essays to study medicine must be a master of his or her profession. A new relationship exists between the leader and his followers, between the teacher and the taught, a relationship of companionship. History is repeating itself in a return to the more conversational methods of the Socratic system. The spirit of mastery which put into the mouth of the teacher that voice of dogmatic authority which became the old prophets of tradition, "Thus said the Lord," is passing away and in its place we hear the voice of more philosophic, more reasonable invitation "Come now and let us reason together." To such a companionship of science, to such an intimate association of research, to such a leadership upon the part of the teacher and to such a following upon the part of the pupil, to the immediate possession of a place, at the very outset of your college career, in the profession of scientific medicine, on behalf of my colleagues, I welcome you. Personally, I do not care to what school of medicine you belong. You may attach yourselves to any or to all schools; you will be safe, and your future patients will be safe, under any banner, if only you are scientists in medicine. If you are not, it matters nothing to what school you claim allegiance, you will be an eventual failure. If you have come here prepared to work with us and for us, as well as for yourselves, determined to make yourselves, not merely practitioners of medicine but medical scientists, I extend to you, in the name of this University, the right hand of scientific fellowship. If one of you has come here to purchase a diploma and to gain it by the shortest and easiest route to its attainment, I want to bid you, in the name of medical science, to find a less exacting and more lucrative calling; or, if you must seek it upon this commercial basis, to go where diplomas are for sale.

But, believing as I do, in the sincerity with which you seek admission to this honorable and scientific profession, let me ask you to begin your career with a clear recognition, not only of the demands which it will put upon you at the end of your college course, but also of the demands which it puts upon you, as men and women, as physicians in the making, now. If you are to be a medical scientist you must be equipped to become one. If you are to be a master among men you must have a due preparation for the mastery of your science. A pyramid can not be reared upon the dimensions of its apex. A new education in medicine is before you. A new standard of requirements measures you. If you are to survive in the

fierce struggle which awaits the competitors of to-day in this calling of ours, you must be fit to survive. If you are not, that struggle will surely crowd the unfit eventually to the wall. The success of our sowing will depend upon the quality of the soil you offer to the seed. The character of the harvest you yield, will reflect upon the prior preparation of the brain soil you bring to the seeder. You will join with me, I know, in congratulating this college and the university to which it belongs, that it has already planned to safeguard, still further than it now does, these portals to the profession by demanding of its matriculants a higher measure of preliminary culture than they have been required to possess in the past. The higher evolution of the science of medicine must depend upon the quality of the men and women who gather in its institutions of learning and graduate from their halls. The medical science of the future will be the product of the labors of the profession, not merely among its masters, but in its mass.

ORIGINAL ARTICLES.

REPORT OF ONE HUNDRED CASES OF EXTRACTION OF HARD CATARACT.

Read in the Section on Ophthalmology, at the Forty-seventh Annual Meeting of the American Medical Association, held at Atlanta, Ga., May 5-8, 1896.

BY LYMAN WARE, M.D.

CHICAGO, ILL.

It is not unusual for a surgeon, whether East or West, at home or abroad, to consider his special method of extraction of cataract superior to that of any other. Certainly, when one's cases are somewhat limited, it is infinitely better to become perfectly familiar with a special method and adhere to it as closely as possible, and whenever changes are made in order to accomplish some definite object, they should be gradual. The operation to be chosen should be the simplest and easiest of execution.

The loss of an eye means much to a patient, whether he be rich or poor. Relatively speaking, it is as unfortunate for an oculist to lose an eye as for a surgeon to lose a life. From Daniel's time to the present it has ever been sought to simplify the operation. I may be considered too conservative, but the results I have obtained will, I am sure, compare favorably with those of any other method, and I think that in the future they will be better than in the past, for the simple reason that "practice and care make perfect."

When there is no complication, that is, no disease of the eye aside from the cataract, and when the patient is reasonably tractable, every operation ought to be a success. A number of years ago I reported (in the *Chicago Medical Ex.*) Von Jager's method of operating, which impressed me most favorably. Many of you can recall the grace and ease with which he operated; seated, after the manner of Daniel, on a stool directly in front of, and somewhat higher than the patient, who faced a large window, he considered it play to remove cataracts. His methods seemed to me ideal. The first twenty-five cases operated upon, I attempted to follow them in most respects. I used his concavo-convex knives, and cystitome, but instead of facing, I found it easier to stand behind the patient, who either lay upon a table near or sat in a chair facing a window. A single and simple obstacle caused me to substitute Von Graefe's for Von Jager's knives.

However simple it may seem, it was almost impossible to get Jager's knives sharpened in this country. After trying a number of instrument makers in Chicago and New York, I finally became discouraged and wholly discontinued their use. No knife, in my experience, makes so clean and even an incision as Von Jager's when in perfect condition, and no wound heals so quickly.

The cases here reported were charity patients. Preliminary iridectomy was done in most of the cases; in those where the cataract was fully ripe and the patients came from a distance, the extraction was done within a week or ten days after the preliminary operation. When the cataract was *not* fully ripe, or the patient lived near, a longer interval was allowed between the two operations. Usually only a small portion of the iris was excised, and as it was always under the upper lid, there was no deformity, nor was there, after the lapse of a few weeks, any complaint of dazzling or glaring light. The subsequent appearance of the eye was that of a very moderate coloboma. But should some deformity exist, what is that compared to useful vision? Truly, more time is required of both operator and patient, but what is time to the doctor when an eye is at stake, or to the patient who may have groped in darkness for years? Then, too, by a preliminary iridectomy at least two important questions may be solved—how the patient, and how the eye is going to behave. One is warranted in stating that the first operation will be the more severe, and consequently if the patient is tractable and quiet during the first, there is little doubt that he will be equally so during the second. If there is any predisposition to conjunctivitis or inflammation of any form, the preliminary iridectomy and subsequent treatment will most probably develop it, in which case the extraction would be deferred until the disease was completely cured. Patients were not operated upon until they became somewhat familiar with the surroundings, that is, one or two days after their admission. The preparatory treatment consisted in giving a slight mercurial laxative and bath the day before the operation, and thoroughly washing the head. The immediate treatment consisted in irritating the cul-de-sac with a solution of mercury bichlorid, 1 to 5,000, and then with a saturated solution of boric acid, followed by the instillation of a few drops of a 4 per cent. solution of cocain every three or four minutes until the anesthesia of the cornea was complete. As a rule, but three instruments were used—fixation forceps, knife and cystitome. An assistant lightly raised the upper lid while the corneal section was being made, which usually included the upper two-fifths, and was made in the cornea at the sclero-corneal junction. In cases where the lens was very large and hard the section was made even larger, including nearly one-half of the cornea, as was originally advised. I am sure that a small section is a most serious mistake, and probably causes more complications and the loss of more eyes than all others combined. The capsule was uniformly opened in the periphery after Knapp's method, except in those cases of hypermature cataract, and where the capsule appeared tough or showed calcareous deposits, when the lens was removed with the capsule by means of Föster's capsule forceps. It is to be regretted that it is not always possible to determine in advance when a lens can be removed in its capsule, as the result is so much better than when the capsule is incised and