MEDICAL PROGRESS:

By A. N. BELL, M. D.

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AN ORATION

ON THE

FORTY-SEVENTH ANNIVERSARY OF THE MEDICAL SOCIETY OF THE COUNTY OF KINGS.

BY A. N. BELL, M. D.,

Physician to Brooklyn City Hospital. Member of the Medical Society of the State of N. Y., of the Medical Society of the County of Kings, of the N. Y. Academy of Medicine, etc., etc.

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MEDICAL PROGRESS.

Recognizing the importance of professional reputation as a society, no less than as individuals, we appear on this our 47th Anniversary with increased numbers and strength, to declare again our continued allegiance to a lineage as old as the civilization of mankind, and to vindicate the honor of our profession by a logical sketch of its progress.

It is the office of logic, in relation to science, to designate, systematise and justify data. Ignoring all hypotheses, logic accepts facts alone, evolves no theories, and accepts no dicta. The facts with which logic deals, however, are of two kinds, *mediate* and *immediate*—those which are derived from direct palpable cognizance of objects, and those that are demonstrable by means of and through obvious knowledge, and verifiable, for knowledge is only such in virtue of verification. Information may be gained by accident, by research, or through systematic laws, but the gaining of information is only the beginning of knowledge; the record is made by verification; and that which cannot be verified has no basis to stand upon.

Facts in medicine, as in everything else, mediately possess the

essential qualities of inference by which asserted discoveries are or are not reducible to knowledge. The logical question, therefore, in regard to all mere assertions, propositions, or judgments, is not whether the assertor, proposer, or judge is worthy of credence, but, *whether in virtue of certain verifiable facts and laws*, the new assertions, propositions, or judgments are true or false.

My purpose is for the time, to measure medicine by this standard, and, as far as practicable, without breaking the chain of my thesis, to exorcise falacies and hypotheses by the logic of facts.

Originally the Medical art was exclusively confined to the priesthood, an hereditary caste of society among ancient nations, that embodied and monopolised all philosophy, in its broadest sense, comprehending the sum total of human knowledge.

By the researches of Oriental scholars*, in recent times, it appears that Greco-Egyptian Medicine was derived from the Hindus; that in the early ages the Hindu philosophers had numerous disciples from Egypt and Greece, among whom they claim Plato and Pythagoras. The most ancient records of Greece are found to accord with recent researches of the East; and when the Greeks attained such a degree of enlightenment as to appreciate the arts, they sought them in the East. Medicine among the rest was transplanted, and in succeeding ages it was cultivated by a succession of men of genius, working in a field of nature under more favorable circumstances for accumulating knowledge than had previously obtained. Inquiry became the ruling spirit, and a sagacious priesthood was equal to the emergency. In Hippocrates, they stamped it with a genius by which the borrower became the owner,—the accredited originator. The oral traditions and incoherent records of diseases and remedies that hitherto had been locked up among the secrets of the priesthood, Hippocrates systematised and arranged into a text book of medicine for the schoolmen of many subsequent centuries. But in so far as the practice of medicine consists more in material things than in words, in like manner does the discoverer of remedial means deserve more honor than he who publishes the facts or reasons upon them.

Mankind had long been sensible of the importance of the knowledge

* Sir Wm. Jones, M. Houdart, Thos. A. Wise, M.D. et als.

of remedies to assuage pain; and the discovery of means for the prevention and cure of disease was deemed to be too important a matter not to be recorded. Information of this kind was preserved, and modified or extended according to the accumulated experience of the most enlightened portion of the community—the priesthood. Hippocrates recognized the fundamental truth, that in medicine the basis of all our knowledge is the accurate observation of actual phenomena, and the correct generalization of these phenomena the sole foundation of sound reasoning. The ancient route, of which he speaks, is the route of observation and experience; and in submitting this, he made full acknowledgment of the advantage he had derived from his predecessors.

From the time of Hippocrates, there was no material progress until the establishment of the School of Alexandria, two centuries later. Aristotle had demonstrated that the heart of animals was the source of the blood vessels, but as the bans of religious reprobation obtained against the touching of the human dead body, this important fact had not been utilised. Theophrastus, a pupil of Aristotle, followed the example of his master in the study of natural history, by arranging and systematising plants.

Comparative Anatomy and Botany thus became auxiliaries of medicine, even before they had worked out their own names. The School of Alexandria eclipsed from the first the Æsculapian temples of Greece, and Alexandria speedily became the resort of all who aspired to a knowledge of medicine. Early in the progress of the Alexandrian School, first became apparent the benefit of integration. The advanced knowledge of the natural history of animals and plants, as exclusively cultivated by Aristotle and his pupils, was, indeed, something more than a suggestive basis for the integration of medicine; it was a practical illustration of the benefit to be derived from a more enlarged field of inquiry, by which these studies were not only recognised as natural preludes to surgery and pharmacy as parts of the Medical Art, but essential to it.

The success of this Greco-Egyptian Institution, was mainly due to the collection of animals and plants, and to the authorization of dissection. But scarcely had two centuries elapsed ere Roman domination checked its progress, and by prohibiting dissection, ultimately gave it a retrogade movement. The legacy of Hippocrates

became the bone of contention for innumerable sects, each claiming to be his true disciples. Men who held or taught pretended principles, acknowledged authority only unto themselves; all else was error.

Pliny, the naturalist, among the rest, derided medicine, while by his researches in natural History he added to its resources. And Dioscorides, although a dogmatic sectator, made substantial additions by a treatise on Materia Medica.

Celsus, in his work "On Medicine," evinced considerable progress, and the more remarkable, since it does not appear that he was ever a practitioner of the art, on which he was unquestionably the most accomplished of ancient authors. Indeed, Celsus' work is the only one which gives information on the state of surgery from Hippocrates to his own time; and by it we learn that many of what are now termed capital operations in surgery seem to have been understood and frequently practiced during that early period.

Previous to and at the time Celsus wrote, medicine in Rome was on a grade with the lowest occupations of a servile populace, which would seem to account for the circumstance that one so accomplished as he was, never engaged in its practice. His knowledge was wholly of foreign origin, notwithstanding he wrote at Rome, and he seems to have regarded the wrangling sects of his native countrymen who called themselves physicians, as beneath his notice. The riot of ignorance continued to rage for a little more than a century later, when it was attacked by the immortal Galen. Unlike Hippocrates in being surrounded by an appreciative fraternity of learned men, he stood alone as it were, in the midst of pretenders and revilers, whose every effort tended to debase the art which he loved. Possessing superior advantages of birth and education, he used them with energy, He laid out and accomplished for himself a broader scope and higher degree of scholarship in all the learning of the period, than any other that had preceded him. He studied philosophy and the arts in the schools of highest repute, while he scrupulously kept aloof from contending factions. His knowledge of medicine he principally acquired at Alexandria, after which he traveled through various countries for the express purpose of gaining information. Finally secure in his acquirements and confident of his power, he devoted himself scarcely less to the exposition of

impostors than to his profession. And so far was he in advance of his contemporaries, that the futility of their reasoning served but to display his superiority. The result was, that on all subjects connected with medicine, he acquired a hold on the public mind that has never been equalled by any other physician. Praxagoras had previously distinguished the arteries from the veins, but the arteries he considered air vessels. Aristotle and Erisistratus adopted and taught this view. Galen refuted it, by showing that the arteries being wounded always gushed blood. And he turned this knowledge to good effect, by tying them for the purpose of stopping hemorrhage. He also showed progress by his accurate knowledge of the human skeleton, and the organs of motion. He demonstrated the muscular filaments, and the ramification of the blood vessels and nerves between them. He traced the nerves of the brain and spinal marrow, and, by experiments on animals, he distinghished the nerves of sensation and motion. He enumerated and classified the nerves into pairs and groups, and discovered several of the ganglia. He recognised the natural divisions of the human body into cavities, and was familiar with the locality and appearances of the chief organs; indeed, his knowledge of particular structures was general, and, in the main, so correct as to constitute the basis of all subsequent anatomical classification. Galen's chief means of acquiring this knowledge, appears to have been the vivisection and dissection of animals; for, while he is authority for human dissection having previously been practiced by others, we have no evidence that he ever practiced it himself. But we have evidence that in the latter part of the second century of the Christian era, shortly before the downfall of the Alexandrian School, and about the time of Galen's attendance there, Herophilis and Erisistratus not only dissected the human body, but that they also vivisected condemned criminals.* Galen also contributed to improve therapeutics, by pointing out the two-fold (primary and consecutive) effects of many medicines; and diagnosis, by defining the shades of difference in the pulse. And to Galen's works, especially, are we indebted for the preservation of the Medical Art in the turmoil of the middle ages. In the final complete destruction of Alexandria, by the

* Renouard, History of Medicine, from its origin to the 19th century, translated from the French by C. G. Comegos, M. D., Professor, etc., Philadelphia, 1867, p. 179.

Arabians, in the seventh century, "some books escaped from the general wreck of literature and science; and there were not wanting some individuals capable of estimating their value. Among these relics were the writings of Galen; and, at an early period of the Saracenic Empire, these books began to be held in very high estimation. They were translated into Arabic; were commented upon in various ways, and soon acquired a degree of celebrity, scarcely short of what they had previously enjoyed among the Greeks themselves.*"

The first reproduction of Galen's writings, by the Arabians, was by Rhazes, about the end of the 9th century. The only progress indicated by him, is the free employment of what were called chemical remedies, and his description of small pox and measles. For his knowledge of small pox, however, he refers to an Alexandrian physician, named Ahrun, who had described it nearly three centuries before.

Avicenna, two centuries later, gained a reputation by his medical writings, for great profundity of learning, while his highest ambition seems to have been a thorough knowledge of the works of Galen, which he believed to contain the sum of medical wisdom. He made a large collection of material from all quarters, almost regardless of its value. And it is particularly notable that, in his chapter on leeches, he acknowledges Indian authority; and his description is word for word that of Susruta, who wrote a thousand years before the Christian era.† Indeed, all of the accredited improvements made by the Arabians seem to have been derived from the same source. They were gatherers and conservators, but not originators. And by the intervention of the crusades between the Asiatics and Europeans, the Arabians only gave back in a new dress, that which they had derived, in the first place, from the relics of Alexandria, and that which they obtained from India.

The first Christian prince who concerned himself with medicine, was Roger, the founder of the kingdom of Sicily, A.D. 1140. He proclaimed an ordinance, requiring every person who purposed to devote himself to medicine, to obtain authority from a magistrate,

* Cyclopædia of Practical Medicine, vol. 3, p. 200.

† Boyle, Asiatic Journal, vols. 3, 4 and 5. Review of the History of Medicine, by Thos. A. Wise, M D., 2 vols. London, 1867.

under pain of confiscation and imprisonment. From this time many other princes followed his example, in establishing regulations and restraints, which, in the end, led to medical organizations, and the institutions of faculties and universities. In the thirteenth century, Frederick II., grandson of Roger, issued an edict, in virtue of which no one could practice medicine in the kingdom of Naples who had not been examined and created a master in the School of Salerno. To effect this, candidates were required to be of legitimate birth, to be twenty-five years of age, to have studied logic three years, medicine—including surgery—five years, and to undergo public examination on the therapeutics of Galen, and the aphorisms of Hippocrates; which, being satisfactory, an oath was administered for faithful conduct—to submit to the rules regulating practice, not to share the profits of the apothecary, and to gratuitously attend the poor.

The School of Salerno flourished from the eighth to the thirteenth centuries, and is said to have been founded about the middle of the seventh century, by some of the professors who escaped from Alexandria when it was overrun by the Saracens.

In the time of Charlemaigne, the cathedrals of France, generally, possessed schools where writing, reading, arithmetic, singing, theology, and sometimes medicine, were taught; and before the portals medical advice was given to the poor. From mere medical advice, in the first place, sprang the practice of dressing wounds, and simple surgical operations. On account of this, about the middle of the twelfth century, the Pope declared the practice of surgery incompatible with the priestly office, and forbad every bloody operation, on pain of excommunication; but in order to still maintain jurisdiction over learning, medicine was made a branch of university education, and it was thus that during the thirteenth century most of the great universities of Europe were created. Practical medicine still remained in the hands of the priests, the only men who, at that time, could maintain pretention to learning, while surgery was abandoned to the ignorant and irreligious barbers, bathers and bonesetters, who were looked upon with such contempt as to be excluded by birth from apprenticeship to an artisan.

Early in the fourteenth century, the School of Salerno was excelled by that of Bologna, by the revival of the dissection of the human body. In A. D. 1315, Mondini, a professor in the School of

Bologna, dissected the bodies of two women, and shortly after wrote an account of it, illustrated with drawings from nature. To him, therefore, belongs the credit of being the first to add pictorial illustration to anatomical description. His dissection, however, was scarcely less crude than that practiced by the ancient Hindus. "Beneath the veins of the forearm," he remarks, "we see many muscles, and many large and strong cords, of which it is not necessary to attend in the anatomy of such a corpse (a recent one), but on one dried in the sun for three years, as I have shown otherwise in developing the number and the anatomy of those of the superior and inferior extremities." He takes an opposite and unnatural course to discover the nerves, advising maceration in running water.* For more than a century later, no one dared to follow the example of Mondini, in applying the dissecting knife to the human body. Mondini's conscience seems to have smote him for his first attempt, since he did not venture to open the skull, for fear of committing mortal sin. And his scruples were more than confirmed by the bull of Pope Boniface, forbidding eviseration and anatomical cooking. A practice which Halfinx states was only intended to prohibit the custom of the Crusaders of cutting up and boiling the bodies of their relatives deceased in infidel countries, so as to send them to their burial places in holy ground! It is certain, however, that the same bull was interpreted as prohibiting the dissection of the human body, for, in 1482, the University of Tubingen had recourse to the authority of Pope Sixtus IV., to obtain permission for dissection.†

During the middle ages, charitable institutions, hospitals and medical schools were extensively multiplied; and popes, princes and priests gave examples of devotion to the religious sentiment of the age, by personally attending the diseased and wounded. During the general prevalence of plague and other epidemics, public baths were instituted in many cities and this measure alone, probably, did more to appease the ravages of plague than all other means combined. War, famine and disease concurred to test the zeal of devotees, to a degree unequalled at any other time. "During the period of universal distress, the monasteries of Constantinople had

* Renouard—First practised by the Hindus.

† Hist. de l'Anatomie lib. v., part iv.—Renouard, p. 291.

been, for some time, the refuge of the learned men who had been driven from Italy, by the perpetual wars in which that country had been engaged. They had taken with them what they had considered their most precious treasures,—the manuscripts of the ancient classical writers—probably regarding them more as objects of curiosity than of real importance. These manuscripts had now been buried for a long time in their libraries, their existence being unknown to the rest of the world. When the Monks were expelled from their retreats by the Turks, and flying into Italy, they carried back with them their manuscripts. A spirit of improvement had already begun to manifest itself in Italy, which was considerably incited by their guests, who, in their turn, by their change of situation, and by the new society into which they were introduced, became more aware of the value of their literary treasures; while their own acquirements, limited as they were, gave them a degree of respect with their new associates, which tended to inspire them with a desire of further improvement.* " It was thus that, A. D. 1483, Mahomet II., having undertaken to destroy all the treasures of Greek learning, was instrumental in preserving them. The art of printing had been invented but a few years before, and the Western world was thus supplied with an amount of the most valuable material. The taste for Greek literature, which had already begun in Italy, was cultivated with such ardor that the Arabic was speedily displaced. The monuments of Greek and Latin learning were collected and published, and the pathway of science paved with imperishable lore. In addition to this, the art of printing supplied the means of circulating monographs of particular diseases and cases, with the reports of hospitals and other institutions for the care of the sick. These early publications on medical subjects, although intrinsically of little worth, served to re-establish a habit of observation, and to direct attention to facts as the foundation of true medical philosophy.

At the beginning of the fourteenth century, Pitard founded a College of Surgeons, in Paris, out of the Brotherhood of St. Cone, a society of barbers, which occupied a sort of middle ground, above the barber surgeons, and below the physicians, and in communion

* Ackerman, ch. xxvii Cabanis,—Cyclopædia of Practical Medicine, vol. iii., p. 206.

with both. In the course of a century, the institution had so prospered, that it was admitted to a union with the university, and from that moment, says Malgaigne, a new state of things commenced. The medical schools of Padua, Pavia, Milan, Rome, Naples and other cities, all acquired celebrity; yet they confined their curriculum almost exclusively to the works of Galen. In the latter part of the fifteenth century, Thomas Linacre, of Canterbury, who is said to have been the first of his nation who learned to speak purely the language of the Romans, perfected his studies in Italy, and was, soon after, made physician in ordinary to Henry VII. and Princess Mary. Through his learning and translation of the works of Hippocrates and Galen, two chairs were founded at Oxford and Cambridge, the incumbents of which had to explain the writings of these ancient worthies. Linacre was also the chief instrument in founding the College of London. At that time, the bishops alone had the right of bestowment of medicine in their dioceses; whence it was that the practice of medicine continued in the hands of monks and illiterate empirics. Linacre had need of all his learning and position at court, to do away with these prerogatives of the bishops; but his perseverance and enlightened zeal were equal to the task. He obtained the issue of letters patent, prohibiting the practice of medicine by any one who had not received his degree in one of the two universities in the kingdom, and who had not been examined by the president of the college at London, assisted by three physicians, delegated expressly for that purpose. Chiefly through the efforts of Linacre, celibacy ceased to be obligatory on medical men, and ecclesiastical benefices were no longer sought as desirable for a physician.*

In 1536, Ambrose Paré, a barber surgeon, of Paris, made his first campaign as surgeon to Marshall de Monte. Freed from the yoke of authority, which had for centuries environed medicine with superstitious blindness, he determined to observe for himself, and to accept the suggestions of experience, based upon accurate observation, as paramount to the doctrines of the ancients. Galen's method of tying the vessels for the purpose of stopping hemorrhage, which had long since fallen into disuse, Paré restored; and he was

* Friend.

probably, the first to employ the ligature after amputations, instead of the actual cautery.

Hitherto gunshot wounds were thought to be poisonous, and were treated by the application of boiling oil, hot pitch, or red hot iron. Among Paré's first observations, was, that wounds which had escaped these severe applications were the better for it, and from that time he discarded them. Notwithstanding, barber surgery continued to prevail in its most contemptible aspects.

In 1542, the barber surgeons of London were, by act of parliament, raised to a dignity similar to that of the College of St. Cone, of Paris, under the name of "Company of Barbers and Surgeons." The same act directed that the masters, or governors, of the said company, should have at their free liberty and pleasure "the bodies of four felons to experiment upon.*" It is uncertain whether dissection was forthwith proceeded with in England; but, in 1566, anatomical demonstrations were made at stated periods, in a public hall set apart for that purpose; and there was also a readership of anatomy held by physicians appointed by Royal authority.

Early in the sixteenth century, the popes, who still stood at the head of scientific movements, withdrew their interdictions of anatomy, and the universities of Italy gave the first examples of dissection. Achillini, Benedetti, and perhaps also, Jacques Berrenger, dissected at Bologna and Padua, previous to A. D. 1500. But there was no substantial progress until about the middle of the sixteenth century. Vesalius was the first after Paré, who dared to subordinate Galen, and show his errors, on the ground that the greater part of Galen's dissections having been of monkeys and other animals, did not represent the human structure. This made him many enemies, but also some friends and followers. Dissection, which had at the first been pursued privately, was now practiced openly, in amphitheatres erected for the purpose. Anatomical chairs were created, and paid out of the public treasury, and permission given to use the dead bodies of criminals not only, but others. Human intelligence, long buried in a lethargic sleep, gradually roused up, and signified its rising by discoveries of the highest importance. Learning emerged from the cloisters, and once

* Chelius Surgery, vol. I., p. 19, Philadelphia, 1847.

more showed itself abroad as in the days of Pythagoras, but with means of improvement far more numerous and efficient. Greek and Latin literature was exhumed from the dust of the convents, and studied with avidity. Soon these monuments of ancient learning were found to be insufficient to satisfy inquiry. Criticism more and more severe revealed numerous defects, and finally stripped these still venerated relics of their sacred character, and assigned them a place from which they might henceforth be improved upon, and perfected in proportion to the advancement of human intelligence. The scalpel took the place of the razor, and the foundation of rational medicine was laid in anatomy. Plates made muscular fibre distinguishable from nerve expansion; lymphatic vessels appreciable; the muscular structures of the heart apparent; and the circulation of the blood became a desideratum. The pulmonary circulation was almost discovered in 1550, by Servetus. He denied that any blood passed through the septum, as then taught by others, and asserted that it all passed through the lungs, by the pulmonary artery, and returned by the pulmonary veins. Andrew Cesalpine had discovered and taught, that "the openings in the heart are disposed in such a manner, that the passage is free from the vena cava into the right ventricle, and from that cavity into the lung; a communication from the lung to the left ventricle, and from this last, into the aorta. Membranes are placed at the orifices of the various conduits in such a way, that a retrograde flux of the liquid column is impossible."* Aided by Aquapendente, he demonstrated the course of the blood through the lungs, and added that the last or most minute ramifications communicated with the veins; that the blood passed from the arteries into the veins during sleep, which he inferred from the swelling of the veins, and the diminution of the pulse at that time. The valves of the veins were also known; and it had been ascertained that the ligation of an artery stopped the pulse below, and that a ligated vein shrunk above the ligature. Among the most diligent students of anatomy, of the time, was William Harvey. Returning to London, from Padua, where he had studied the requisite five years for his degree, he entered upon professional life, while he continued to prosecute the study of anatomy, making, in conjunction with his dissections, a large number of

* Renouard, p. 298.

vivisections. Possessed of all the facts that had previously been made known, and endowed with a spirit of inquiry and perseverance equal to the importance of his pursuit, every step of his progress was a crucial experiment. Thoroughly embued with the idea that certain truth could only be known by the regular and constant succession of one phenomenon to another, he was content to labor many years for its accomplishment. Gradually the object he sought revealed itself to him, and took form. Fortified alike with a knowledge of the falacies, as well as the facts of all who had preceded him in the same field of research, he hesitated not to declare the whole truth, and to defend it against all opposition. The whole process of Harvey's researches was in accordance with the principle of "induction upon data carefully collected and considered." The motion of the blood, and its existence in the arteries and veins, had been long known; but the important fact that it made a continuous transit from the arteries into the veins without interruption, was reserved for Harvey. Yet he never *saw* this. He knew not *how* the blood got from the arteries into the veins. But the fact he was sure of, by induction, as a necessary consequence of mediate data he had carefully collected and considered. Harvey lived to see his discovery universally accepted, though it was not fully demonstrated until three years after his death, by Malpighi, who, in 1661, demonstrated, for the first time, by aid of the microscope, the progression of the blood through the capillaries.

Until about the time of Harvey, it had been the practice for many centuries, to place at the head of all philosophical treatises certain axioms improperly named "principles," as an index of the writer's purpose. And the axiom of Aristotle, "*Nihil est in intellectu quod non prius fuerit in sensu*," had been received as the quintessence of scholastic philosophy. But at the beginning of the seventeenth century, scientific progress had so far comprehended scholastic philosophy as to shake to the surface all that was of value; and we find medical philosophers practicing the reverse of Aristotle's dogma. To seize upon, and combine this new process of improvement into a system, was the work of Francis Bacon; but, that "particular ideas are the basis of the pyramid, and axioms the summit; to study and apply what is known to the discovery of new

truths by induction, by which our senses are guarded against error;"* that these ideas were actuating principles long before they were enunciated by the great philosopher, admits of no question. And it has been truly remarked, that had Bacon been wanting an example to illustrate the truth of his doctrine, it would not be easy to adduce a more striking example of the way in which ultimate rational truth is arrived at, by a succession of inferences, than is contained in Harvey's Essay on the Heart and Blood.†

The spirit of Harvey was contagious. The process by which he had arrived at such an important truth opened up new fields of research. The discovery of the circulation of the blood was, after dissection, in a great measure due to the vivisection of animals, the only means, other than experiments on the human body, by which such knowledge is attainable. There was, at that time, a sentimental criticism of Harvey's experiments, such as has frequently manifested itself from various quarters since. To intelligent minds, generally, the importance of Harvey's discovery and its congeries, are an all-sufficient reason. But, unfortunately, for the good of scientific inquiry, there always exists a respectable number of persons who, incapable of appreciating the motives of profound inquiries for the good of mankind, arrogate to themselves the sum of humanity. They cannot be made to see that every step taken in the science of man's life, is an important part of the progress that adds to the sum of human happiness for both the present and the future.

Shortly after the time of Harvey's discovery, Asellius, of Milan, while examining the abdominal viscera of a dog that had been killed soon after eating, discovered the process of nutrition—the *lacteal* circulation. His discovery, like Harvey's, had been preceded by certain intimations, as it were, by Fallopius and Eustachius, half a century before; but neither of them comprehended anything of the use, or the relation of the lacteal vessels to the sanguiferous system. Asellius regarded the lacteals as having a distinct function, and traced them to their origin in the mucous surface of the intestines; but their termination in the thoracic duct, was not discovered until thirty years later, by Pecquet. The lymphatic and absorbent systems were discovered in a similar manner, by other observers.

* Nov. Organ: lib. 1, ch. 1.

† Works of Harvey, by Robert Willis, M. D. Introduction.

These discoveries led to the use of high magnifying powers in anatomical researches, the pioneers being Malpighi and Leeuenhoec. By this means they were the first to demonstrate the movements of the blood discs in the capillaries. By the same means, De Graaf, Mayo, and others, made important progress in the knowledge of respiration, generation and gestation; and Vieusens, Willis, Pinel, Kepler, and others, improved our knowledge of the nervous system. Meanwhile, there were "Mechanical," "Chemical," "Metaphysical," and other sects, and numerous individuals, as at the present day, who professed to possess certain cures for all the diseases that flesh is heir to, without any rational knowledge of the human organism, or of the remedies which they used. Joubert, a sprightly writer of the time, after having shown the presumption of so many persons assuming to act as physicians, without the requisite knowledge, narrates the following adventure:—"It is said that the duke of Ferrara, Alphonso d'Este, at one time proposed, in a familiar way, the question,—'In what calling are most men engaged?' One said, 'shoemakers;' another, 'tailors;' a third, 'carpenters, masons, pettifoggers and laborers.' Gonelle, his famous buffoon, said there were more 'physicians' than any other class of men, and made a bet with the duke, who denied it, that he would prove it in twenty-four hours. The next morning, Gonelle left his lodging, wearing a great night cap, and a cravat tied round his chin; then a hat over all, and his mantle drawn up over his shoulders. In this attire he took a route through a populous street leading to the palace of his master. The first person he met asked him what was the matter? He replied that he had a raging toothache. "Ha, my friend," said the stranger, "I know the best remedy in the world against it," and told it to him. Gonelle inscribed his name on his tablet, pretending that he was writing down his recipe. A step further on, he found two or three together, who all asked the same question, and each one gave him a remedy. He inscribed their names, as the first. And thus he pursued his course, very gingerly, to the end of the street, not meeting a single person who did not offer him a recipe, and different from the rest, each one assuring him that his remedy was established, certain and nearly infallible. He wrote down the names of all. Approaching the lower court of the palace, he found himself surrounded with

gentlemen (for they all knew him), who, after having learned his affliction, compelled him to take their recipes also, which each one assured him was the best in the world. He thanked them all, and wrote down their names. When he entered the chamber of the duke, his excellency cried out, "Eh! what is the matter, Gonelle?" He replied, very piteously and complainingly, "The toothache, the worst that ever was." To which his excellency replied,—"Ha! Gonelle, I know a thing which will drive off the pain at once, without touching the tooth. Mr. Antonio Musa Brussavolo has never employed a better one. Do so and so, and immediately you will be healed." Gonelle suddenly threw off his head dress, and his other attire, crying out, "And you, also, my lord, are a physician!" Look at my list, and see how many others I have found, between my lodging and your palace. Here are nearly two hundred, and I have not passed through one street. I will engage to find ten thousand in the city, if I go everywhere. Find me as many persons in any other business."*

At about the beginning of the 18th century, the spirit of inquiry was severely contesting authority in everything. And in medicine particularly, numerous important facts were in process of discovery. Great names had lost their potency, and inquiries after truth were gradually working into the necessity of self-reliance. Many well conducted experiments and accurately observed phenomena had been wrought out by enthusiasts in quest of shadows ; but there were some reflective minds who made it their purpose to acquaint themselves with all the facts that had been adduced, for strictly utilitarian purposes. Foremost among these were Sydenham and Boerhaave. Although they were not wholly free from the hypothetical doctrines of the time, these were never allowed to gain such ascendancy over their minds as to interfere with a sound judgment. With them, experience, based on accurate observation, always took precedence of theory. Their uncommon sagacity in the diagnosis of disease, and discrimination of remedies, were due to a determined subordination of theories to facts, and not facts to theories. They were both not only learned in their profession, but in its collaterals ; and they possessed in a high degree the faculty of availing themselves of the knowledge of their con temporaries, and

*Erreurs popularies par Laurent Joubert, 1587.

of so utilizing it as to increase the resources of medicine. With unselfish devotion and industry that never contemplated less than a knowledge of everything conducive to the successful application of their profession, they impersonated in an extraordinary degree the qualities essential to a sound progress. To Boerhaave, especially, are we indebted for the permanent revival of clinical instruction. This means of improvement was first practiced in the latter part of the sixteenth century, at the Hospital of St. Francis, Padua; and subsequently by Sylvius, at Leyden, whose clinics were held in high repute, and caused him to be regarded as the founder of this mode of instruction. But his successors let it fall into disuse for more than forty years, when it was revived by Boerhaave, who became so renowned that auditors attended him from all parts of Europe. And, owing to his success, clinical instruction was speedily established among all civilized nations.

The interval from Harvey to Boerhaave is particularly notable for the number and industry of its laborers, and the number of isolated facts brought to light. By the increase of anatomical knowledge, the publication of hospital reports, essays and treatises, operative surgery, especially, and the treatment of injuries, advanced to a high degree. Post-mortem examinations had occasionally been made from the earliest times,* but they had not earned a name. No records of such examinations seem to have been preserved until from about the beginning of the sixteenth century of the Christian Era. A. D., 1507, Antony Benivieni, of Florence, prosecuted post-mortem examinations, extending even to the practice of other physicians. Eustachius, also pursued the same course, and thus made many important contributions to anatomy. But much prejudice existed against the practice, and great perseverance was necessary to overcome it. Among those who made the most progress in this direction was Marcellus Donatus. "Let those," said he, "who interdict the opening of bodies well understand their errors. When the cause of disease is obscure, in opposing the dissection of a corpse which must soon become the food of worms, they do no good to the inanimate mass, and they cause a grave damage to the rest of mankind, for they prevent the physicians from acquiring a knowledge

* Pliny.

which may afford the means of great relief eventually to individuals attacked by a similar disease. No less blame is applicable to those delicate physicians, who from laziness or repugnance, love better to remain in the darkness of ignorance than to scrutinize laboriously, truth; not reflecting that by such conduct they render themselves culpable towards God, towards themselves, and towards society at large."*

For nearly a century subsequent, superstition outweighed the efforts of physicians to gain information by the opening of the human dead body. And although a number of medical philosophers from time to time assayed to improve their knowledge by this means there was no substantial progress. A sagacious mind was wanted who might rehearse, collate and classify the material facts that had been discovered in the progress of anatomical researches, and so generalize them as to induce truth.

Haller, the pupil of Boerhaave, trained from early age to the habit of close observation and study, entered upon the investigation of anatomical facts and physiological phenomena with a clearness of perception and judgment which led him to reject all mere matters of opinion and to receive nothing without personal verification. He pursued his investigations with characteristic patience in connection with well directed researches and experiments, and induced from the facts he had verified, irritability and sensibility as specific properties of all the muscular and nervous systems; that to either one, or both of these properties jointly, may be attributed all vital phenomena. He also traced out and discovered the process of developement of the fœtal heart and circulation, and originated the science of teratology. Indeed, his labors contemplated a reinvestigation of all that had been previously made known in the progress of anatomy and the functions of the human organism. "It can be shown," he remarked, "even by positive calculation, that it is not possible in twenty years to work out thoroughly all parts of the human body. Animals must be dissected, but it is by no means

* Marcellus Donatus, Medica Historia, lib. IV. Renouard, p. 305.

sufficient to dissect their dead bodies; they must be vivisected. In a dead body motion is wanting. It is necessary, therefore, if we would witness motion, to observe the living animal."*

The example of Haller in carefully abstaining from all speculative opinions and of confining his researches exclusively to experiment and observation, was scarcely less beneficial than his material improvements. He, in this way, gave a new impulse to science by the spirit with which he conducted his investigations. Cullen, the cotemporary of Haller, pursued the same philosophical spirit. He estimated the properties of medicines by careful and almost skeptical observations, by which he avoided errors and inconsistencies, and distinguished the effects of remedies from physiological phenomena. His *vis medicatrix naturæ* expresses his appreciation of the specific effort of the natural powers of the organism to resist and overcome disease, and an intelligent recognition of the importance of accurate knowledge of morbid phenomena.

From Haller to Bichat was but a single step. The ancients imagined that every solid organ was reducible to what they called elementary fibre—a compound of earth, iron and oil, and everywhere the same. Haller's conception of this elementary fibre was, that it was to the anatomist what the line is to the mathematician. His genius endowed it with a quality only; of its substance he was ignorant. Following Haller's minute dissections, a number of investigators recognized the resemblance of certain membranes in different parts of the organism which previously had been regarded as independent structures. One of the earliest of these observers was Andrew Bonn, who published a Thesis in 1763, entitled, "*De Conditionibus Membranarum*." Fifteen years later, Carmichael Smyth, read a paper on Inflammation, wherein he attributed the causes of the specific distinctions in the various forms of inflammation, to the differences in natural texture. He cites examples of inflammation of the mucous membranes, serous membranes, muscular fibres, etc., in each of which the inflammation is distinguishable by peculiar characters—though in different parts.† This appears to have been the earliest effort to classify disease according to the

* Preface to *Elements*.

† Medical Communications, Vol. II, p. 163

structure of the organ or tissue in which it exists. About the same time Baillie and Pinel each adopted a similar method of designating diseases according to organic structure. Insignificant as these beginnings in the study of structural anatomy now appear, they were the preludes of the most important discovery in the progress of medicine. The ideas of Bonn, Smyth, Baillie and Pinel, were seized upon by Bichat and elaborated into a substantial organic basis of a new science. Devoting himself with almost unparalled patience to the investigation of minute anatomy, Bichat sacrificed every thing else to the advancement of the object of his research. Some notion of his ardor and industry may be formed from the fact that in the short space of six months he personally examined over six hundred human dead bodies.* His indomitable energy was but the counterpart of a genius worthy of the task he undertook. Verifying all that was known before, he grasped the residue, and from it accomplished the brilliant achievement of separating the human body into its elementary tissues. And these he not only defined and described in a morphological point of view, but in detail—in their physiological functions and morbid conditions; in such wise as to render them easily recognizable by fixed properties under whatever circumstances and wherever they may be found. The elementary tissues so well described by Bichat, are the origin and foundation of Histology in all its phases, and the scientific basis of modern medicine.

For the next thirty years after the discovery of Bichat, many anatomists occupied themselves in rehearsing his researches in quest of new truths, in projecting instruments, and in experimental inquiries and clinical observations on the functions of organic life. The examination of the elementary tissues of animals, found analagous researches into the tissues of plants. Robert Brown, Slack and others published important observations on the elementary structures and physiology of plants; and Schleiden, penetrating still further in a paper entitled "Phytogenesis,"† pointed out small sharply defined granules, generated in a granular substance surrounded by cell nuclei or cytoblasts, which he likened to granulous

* Notice Historique sur Bichat. Maingault, Edition of the Gen'l Anat.

† Muller's Archiv fur Anatomie.

coagulations around the granules. These observations were communicated to Schwann, who was struck with similar appearances in animal tissues, and thereupon conceived the idea that the same character of developement which Schleiden had discovered in plants would be found equally true of animals. From this time Histology made rapid progress, and in no other way can we so well present this most important step in medical progress, as in the words of Kolliker, one of its greatest promoters, "In the year 1838, the demonstration of Dr. Thomas Schwann of the perfectly identical cellular composition of all animal organisms, and of the origin of their higher structures from these elements, afforded the appropriate conception which united all previous observations, and a clue for further investigations. If Bichat founded Histology more theoretically by constructing a system and carrying it out logically, Schwann has by investigation afforded a basis of facts, and has thus won the second laurels in the same field. What has been done in this science since Schwann, has been indeed of great importance to physiology and medicine, and in fact of great value in a peculiarly scientific point of view, inasmuch as a great deal which Schwann only indicated or shortly adverted to as the genesis of the cell, the import of the nucleus, the developement of the higher tissues, their chemical relations, etc., has received a further development, but all this has not amounted to a step so greatly in advance as to constitute a new epoch. If without pretensions to prescience, it be permitted to speak of the future, this condition of Histology will last as long as no essential advance is made towards penetrating more deeply into organic structure, and becoming acquainted with the elements, of which that which we at present hold to be simple is composed. If it be possible that the molecules which constitute cell-membranes, muscular fibrils, axile fibre of nerves, etc., should be discovered, and the laws of their apposition and of the alterations which they undergo in the course of their origin, the growth and the activity of the at present so-called elementary parts should be made out, then a new era will commence for Histology, and the discoverer of the law of cell-genesis, or of a molecular theory, will be as much or more celebrated than the originator of the doctrine of the composition of all animal tissues out of cells. * * * * *

As regards the general positions of Histology, the science has made no important progress since Schwann; however much has been attained by the confirmation of the broad outlines of his doctrines. The position that all the higher animals at one time consist of cells, and develope from them higher elementary parts, stands firm, though it must not be understood as if cells, or their derivities were the sole possible or existing elements of animals. In the same way Schwann's conception of the genesis of cells though considerably modified and extended, has not been essentially changed; since the cell-nucleus still remains as the principal factor of cell-development and of cell multiplication. Least advance has been made in the laws which regulate the origin of cells and of the higher elements; and our own acquaintance with the elementary processes which take place during the formation of organs, cannot be regarded as very slight. Yet the right track in clearing up these points has been entered upon; and a logical investigation of the chemical relations of the elementary parts, and of the molecular forces after the manner of Donders, Dubois, Ludwig, and others, combined with a more profouud microscopic examination of them, such as has already taken place with regard to the muscles and nerves, and further, a histological treatment of embryology, such as has been attempted by Reichert, Vogt and myself, will assuredly raise the veil and bring us step by step nearer to the desired, though, perhaps, never to be reached end."*

Of the *nature* of disease and its discovery, the ancients for the want of anatomical knowledge regarded all morbid phenomena or symptoms as evidences of something that had entered into or grafted itself upon the body. Hence their treatment consisted in an effort to dislodge it, and chiefly consisted in the use of evacuants. For this reason the introduction of Peruvian bark and some other useful remedies in the treatment of disease were opposed on the ground that they produced no sensible evacuation, and were therefore inconsistent with accepted theory—that no disease was curable without the expulsion of bile, phlegm or other humors. The Stahlites regarded fever as a natural and salutary effort of the soul to free itself from an injurious substance; to arrest it was contrary

* Introduction to Manual of Human Histology.

to the vital principle and therefore likely to do more harm than good. The Arabians held that small pox was innate to man; and therefore to prevent its development was to oppose the action of nature, and to keep the enemy in his place. By the improvement of modern times, disease is known to consist of an intrinsical change in the structure of the organism. The name of a disease may, and usually does express some important fact or characteristic, but this is only an integral part of the existing change. The symptoms present indicate the nature of the changes produced and these changes (not the symptoms), constitute the disease. And, inasmuch as no single organ can undergo a change of structure, or function depart from its healthy standard, without corresponding changes in all the rest, it is apparent that the foundation of the medical art must be laid in an accurate knowledge of the structure and functions of the human body. It may be safely stated in this connection, that not a single remedy for any disease whatever, has ever been discovered by following a theory or hypothesis. But, on the contrary, as truly remarked by Virchow, "the history of medicine teaches us, if we will only take a somewhat comprehensive survey of it, that at all times permanent advances have been marked by anatomical innovations, and that every more important epoch has been directly ushered in by a series of important discoveries concerning the structure of the body.*" The maxim that "knowledge of disease is half its cure," was appreciated, however, though it may not have been expressed, even before the era of Histology. Pathology had already involved the fundamental art of diagnosis as the foundation of all enlightened practice. But the means of exercising the art of diagnosis were far more limited; and the practical results correspondingly inefficient.

The eighteenth century closed with a concurrence of effort on the part of a number of individuals all tending to the same goal—to lift the medical art out of the conjectural hypotheses of ages and establish it upon a scientific basis. The great achievement of Bichat, as already shown, was not accomplished single-handed. Others had begun to clear the way. The young giant quickly ran his brilliant career, but left behind him worthy followers. Laennec, the pupil

* Cellular Patology

of Corvisart, while attending his master's lectures at La Charitè, became strongly impressed with the importance of discovering internal lesions by external signs. As early as 1763, Avenbrugger, a German physician, had introduced percussion as a means of diagnosis, but it had been rejected by the profession and was not again revived until by Corvisart, thirty years afterwards. Boyle, a fellow student with Laennec, applied his ear to the chest, while attending Corvisart's lectures. Laennec followed suit, and conceived the idea of increasing his powers of discrimination by artificial means. May 14, 1815, fifteen days after having read a paper on his favorite study (before the Societe de l'Ecole), he added the stethescope to his means of diagnosis. He was shortly afterwards appointed to the Hospital Beaujon, and soon after to the Necker, which afforded him abundant means for the cultivation of his ear, and the verification of his diagnosis. After three years assiduous study, he published his treatise on Mediate Auscultation. Louis, Andral, Cruveilheir, Meckel, Abercrombie, Mayo, Hope, Carswell, and others progressed in the same direction as Laennic, by diligently studying all the functions of the human body during life, and examining all the organs after death.

Bichat condensed anatomical knowledge into a grand reservoir that ever since his day has been overflowing its banks and fertilizing a continuously expanding field of scientific culture.

Willis, Cabanis, Camper, and other collaborators of Bonn, Smythe, Pinel and Bailie, investigated the nervous system, and were the first to regard the brain as the viscera of the understanding, with special functions in communication with different parts of the organism. The first to discover a difference in the functions of the different roots of the spinal nerves, was Alexander Walker;* and shortly after him, Sir Charles Bell published his "Idea of a New Anatomy of the Brain," showing a difference between the nervous elements employed in the different functions of the nervous system. Subsequently he showed that the nerves of motion were distinct from those of sensation, and *suggested* that the posterior or ganglionic roots of the spinal nerves are nerves of sensation, while the

* Archives of Universal Science, 1809.

anterior roots are nerves of motion. This suggestion was taken up and first claimed by Magendie, and subsequently adopted by a number of anatomists, who have since demonstrated that the difference in the nerves of motion and nerves of sensation as first discovered by Bell, finds its true distinction in the grey and white matter;—the former being the principal conductor of the sensitive impressions, and the latter, impressions of motion. The demonstration of this truth, and still further the decussation of the conductors of sensitive impressions in the spinal cord, and the decussation of the conductors of motive impressions in the medulla oblongata, with elaborate pathological conclusions, have been the result of vivisections and clinical observation.

The discovery of physiological tissue genesis by Schwann, was followed by the still more profound researches of Johannes Muller* establishing pathology on the same basis; in determining the fundamental law of similarity between pathological and physiological tissue development, which has since been so abundantly verified by Wedl, Virchow and others. Vogel, Lebert, Rokitansky, Paget and others, have elaborated morbid Histology in the same vein. Meanwhile the *free* cell-development of Schwann or blastema formation, has been investigated anew by Reichert Henle, Maudl and Remak; the last of whom in 1852, declared *free* cell-development an error, and announced "*Omnis cellula in cellula*,"* as the true conception of cell growth. Two years later Virchow echoed the same doctrine in "Omnis cellula e cellula,"† which is now well nigh the accepted basis of cellular pathology. Virchow's writings are so recent and of such easy access that an attempt to state his doctrines is unnecessary. With a profound respect for the past, he uses the deficiencies of his predecessors as means of improvement for himself, while he enhances their excellences by presenting them in a more favorable aspect. Virchow's labors from the first have been characterized by the same generous spirit. A truth was no sooner known to himself than it was communicated to the profession. And his name is identified in the progress of medicine for the last twenty years to a degree scarcely equalled by any other. By this means his discover-

* Bau der Krankhaften Geschwulste.
* Muller's Archives, 1852.
† Beitr. 2 Spec. Pathologie und Thuapie, 1854.

ies and views have been subjected to examination from all quarters. The result has been that when the time came for him to consolidate his writings, as in the several volumes which he has published during the last ten years, he had the benefit of all his collaborators, and he has so compacted their and his own labors together, and so connected them with the past as to present the sum of anatomical improvement acquired during the present century.

The sum of medical progress now rests upon :—

(1.) An *anatomy*, which in a descriptive point of view is perfect and thoroughly worked out, and structurally nearly so.

(2.) A *Physiology* comprehending not only an accurate knowledge of the functions of the chief organs and tissues which constitute them, but of the molecules of less than one twenty-thousandth part of an inch in diameter, and almost the process of their development. The growth, contractility and movements of the living molecules, being demonstrable by means of the microscope with the same degree of accuracy as the largest cells and fibres; and these molecules are known to possess independent vital actions,—to produce nuclei, cells, fibres, tubes and membranes which unite and form the various tissues and organs of the body.

(3.) A *Pathology*, which determines after death the relations of morbid conditions and the symptoms of the diseases that cause them, in the same manner as the healthy body is explored with a view to a knowledge of its structure—and no less completely. Indeed as descriptive anatomy is perfect, to the same degree is pathology—uniting with anatomy and physiology, to constitute *Histology*, the highest mark of medical progress.

(4.) A *Diagnosis* ;—Aided by the Microscope, Stethescope, Laryngoscope, Opthalmoscope, Endoscope, Spectroscope, Thermometer, Sphigmograph, Dynamograph, and various other speculi and instruments, by means of which the chemico-physiological and pathological changes are studied and recognized. Elementary forms and deposits, amorphous granules, crystaline structures, simple and organized cells—capable of growth or otherwise; granules fibres and compound corpuscles; exudations of every degree of consistence; pigments of various shades—all, in their healthy or morbid states, discoverable, countable, definable. No amount of professed experi-

ence merely, exclusive doctrine or speculative theory can withstand the logical facts elucidated by these means. And they not only doom to inevitable oblivion existing fallacies, but they are a bulwark for the future. Standard specimens of organic forms which compose all the textures of the human body, are now within the reach of every student. And most of the recent works on practical medicine, surgery and histology, are illustrated by the arts of the engraver with what may be deemed standards of comparison for verifying the accuracy of observations by the aid of instruments.

Chemistry and Philosophy, are also instruments of diagnosis. By means of these, plants and animals are transformed in all stages of growth and development; the relations between them and the atmosphere determined; the nature of all substances—organic and inorganic, solid, liquid, or gaseous—are ascertained with precision. Physical and vital actions, chemical, electrical and mechanical influences—are utilized in diagnosis, and among the means at our disposal.

THE PRESENT STATUS OF MEDICINE, and the means by which it has been attained, distinctly point to the source of all future progress. It is in the field of exact scientific investigation into questions and problems which the most recent advances have opened to view. Each new fact, patiently grounded on exact knowledge and established beyond question, though it may for a time appear to be an idle and useless addition, may eventually fructify into some useful generalization applicable in the most unexpected and startling manner to the prevention or cure of disease, and the promotion of human happiness.

THERAPEUTICS.

THE ART OF THERAPEUTICS, comprehending the treatment of disease is commonly considered the rear rank of medical progress. With a brief glance at this, and I will tax your patience no longer. It should be borne in mind that this branch of medicine is not only the most difficult, but that it is, rationally, at least, always the junior. When we reflect upon the number of asserted remedies, the pretended discoveries, the healing arts, the certified effects and the grave-yard certificates of universal cures as the fruit of credulity and other obstacles with which we have to contend; and when

we consider how recently the auxilliary sciences of Botany and Chemistry have made their chief advances; the still imperfect state of meteorology, and other sciences and arts upon which our knowledge of therapeutic means so much depends—the wonder is that the uncertainty is not much greater than it is, instead of being marked, as the relative progress of therapeutics certainly is, by the most signal triumphs in the history of medicine. The art of therapeutics consists in the application of natural and artificial products from all sources to the preservation of health and the cure of disease, hence this branch of medicine must of necessity always remain incomplete.

Many remedies known to be directly curative of certain diseases, such as cinchona and its salts, sulphur, mercury, cod-liver oil, lemon juice, etc., are the result of empirical observation. And so too with regard to the specific effects of such agents as anæsthetics and vaccinia. By accident or experiment, it is discovered that a certain substance is of use in a particular disorder. The same remedy is subsequently and repeatedly administered in like condition, and upon a number of such data an empirical system is established. This kind of practice is in accord with the vulgar acceptation of the practice of medicine, and requires but little knowledge. Those who accept it as the sum of medical knowledge stand in the same relation to modern medicine as the ancients. And by a precipitation of judgment common to the unenlightened, they assert remedies of whose properties they know nothing—for diseases of which they are equally ignorant, and call themselves physicians. But however limited the knowledge, and extensive the danger of such practitioners, the physio-pathological phenomena in the application of remedies, empiracally, are valuable, because their utility is made known by therapeutical proof. Indeed every effort to alleviate human suffering, however humble, is worthy of the attention of the enlightened physician. And we should remember that the powers of mankind in this direction are not wholly limited to the votaries of science. Improvements have frequently been derived from most humble sources, or seized upon under the most fortuitous circumstances. And medical progress as a whole, is the result of the succesful labors of many individuals. While a few persons may be identified

with certain improvements of their time, it is none the less true, as a general rule, that such persons deserve credit for only a part of the progress made under their names. Indeed, silent workers often render the most efficient service, confirming or refuting the published accounts of the few. The final establishment of important truths are usually to be recognized in the co-ordinate experiences of many observers. And every single step in the direction of prevention and cure, is progress.

Referring to modern improvements, in an address before the British Medical Association, recently, Sir William Jenner makes the following remarks:

"Who that has suffered from a painful local affection can think of the alleviation of his sufferings which follows from the subcutaneous injections of an anodyne, without gratitude? Who is there that has had to submit to the knife of the surgeon whose heart does not overflow with gratitude to those who introduced and perfected anæsthesia? The electric telegraph, the greatest marvel of our time, was a thing which in a rough way scientific men had long thought possible; but to cut for stone, and to know nothing of the agony, to have a leg removed and smilingly to ask when the operation is over—when are you going to begin?—these are marvels of which no one dreamt; no exaggerations of fiction equal this reality. The discovery of the value of subcutaneous injection of anodynes, and local anæsthesia by ice, ether spray, and of general anæsthesia by ether, chloroform, and nitrous oxide, are advances in alleviate medicine worthy to rank with the advances in preventive, curative and prolongative medicines."

It well becomes us to be cautious in the adoption of new remedies, and to accept those only which will admit of logical conclusions, based upon accurate knowledge of the nature of the remedy and the state of the organism at the time; involving an accurate knowledge of both structure and function. With such knowledge there is quite as much certainty in medicine as in any other science or profession. And he who reproaches physicians with differing more than other men in identical pursuits, or charges them with being more uncertain in their conclusions than other professions—he who asserts or accepts such propositions has neglected his edu-

cation. Physicians are far from assuming that their profession is perfect. Well do they know indeed, that the pathway to scientific truth is beset with many doubts and clogged with incessant obstacles. The enjoyment of health and long life are recognized by all men as among the greatest boons of human aspirations. The best way to promote these blessings—how to relieve pain, to cure and to prevent disease—are objects worthy of the highest ambition and of the noblest contest. And we maintain that in the exercise of these efforts as a profession, no human pursuit surpasses medicine, either in the certainty of its conclusions or in its positive and increasing blessings to mankind. What, indeed, are the certainties and emblems of progress in other professions and sciences that the reproach of being uncertain and stationary should specially apply to medicine? The law, we are told, is the perfection of human reasoning—its doctrines are confined to questions of right and wrong; in which the whole moral faculties of man instinctively lead the judge to decide aright. Besides, lawyers and judges render their opinions with the utmost deliberation after the amplest opportunity for research. But where are the clients who are satisfied with the unerring opinions of lawyers or the unappealable judgments of courts? The law pleads defectiveness of evidence in extenuation of such uncertainties. But is there any one within my hearing that does not know that the interpretations of organic law, which are wholly free from such questions, are not equally uncertain? Physicians are expected to be in a constant state of readiness to decide upon the most difficult question's at a moment's warning—but who that is informed on these matters will say that their decisions are less certain than the lawyers? Of statesmen;—on manufacturing, tariffs, internal improvements, educational systems, citizenship, banks, legal tenders and gold payments—are opinions unanimous and certain on these questions? Mathematics—that certain science from which engineers and architects with the amplest data for the most precise investigation, are they all of one opinion on the great East River Bridge, or other like structures? And, how will physicians compare with theologians? Are these latter all agreed on the most direct road to the Celestial World? or even on the meaning of words and the interpretation of phrases derived from the same sources of knowl-

edge; or on confessions of faith, administration of ordinances and church government? And, as to being stationary.—Early in the history of mankind, physicians were of those only who occupied the highest social status, and did most for the promotion of the general welfare. And the middle ages were lighted up by stars devoted to medicine, whose constellations uncovered the darkness of superstition. Physicians in all ages have attended at the birth of philosophy and learning—have nurtured them in youth, maintained them in manhood and supported them in declining years. In the progress of modern civilization which took its rise some four centuries ago, who among the learned men of the time excelled Linacre?

We have already shown that Bacon had his peer in Harvey. Newton in the discovery of the universal law of gravitation, also had his cotemporary and equal in Haller, who discovered the laws and special forces of organic life. An hundred years ago the law gave to enlightened nations a Blackstone, but medicine gave them a Jenner! And what language is there that can supply the words to express the blessings he conferred on mankind! The beginning of the present century produced many statesmen, philosophers and scientists—but who among them all is comparable to Bichat! And more recently, of the discovery and application of anesthetics—peerless and alone! The whole world, I fear, will long remain our debtor. Medicine uncertain and stationary indeed! These are no gleanings. But only a few of the stars of the first magnitude in the midst of a galaxy that illumine the civilization of mankind the world over.