Introductory address delivered at the College of Physicians and Surgeons, New York : October 16, 1855 / by Jno. C. Dalton, Jun.

Dalton (Jno. C.)

INTRODUCTORY ADDRESS,

DELIVERED AT THE

College of Physicians and Surgeons,

NEW YORK.

OCTOBER 16, 1855.

BY

JNO. C. DALTON, JUN. M. D.

PROFESSOR OF PHYSIOLOGY, AND MICROSCOPIC ANATOMY.

NEW YORK:

JOHN J. SCHROEDER, MEDICAL BOOKSELLER,

BIBLE HOUSE, ASTOR PLACE.

1855.

Box

At a meeting of the Class of 1855 and 1856 held Oct. 17th, Mr. Jno. Ross Shiell in the chair. The following resolutions were adopted:

1st. To appoint a committee to wait upon Prof. Dalton and solicit the manuscript of his Introductory Lecture, delivered Oct. 16th.

2d. That Messrs. Eug. Peugnet, Geo. F. Shrady, and Jno. T. Crook be appointed the Committee.

Agreeably to the resolution, the following correspondence was entered into.

DEAR SIR:

We, the undersigned, a Committee appointed by the Class, would respectfully solicit in their name, your permission to publish your Introductory Lecture, delivered last evening.

We remain yours, respectfully,
GEO. F. SHRADY,
JNO. T. CROOK,
EUGENE PEUGNET.

To Prof. JNO. C. DALTON, JUN.

New York, Oct. 17th, 1855.

GENTLEMEN:

Your polite note requesting permission to publish my recent Introductory Lecture has been received. The only return I can make for the honor you do me, is to comply with your request. Such as the Introductory is, I place it in your hands, and remain,

Your obedient serv't.
JNO. C. DALTON, JUN.

To Messrs. GEO. F. SHRADY,
JNO. T. CROOK,
EUGENE PEUGNET.

New York, Oct. 18th, 1855.

At a subsequent meeting, Mr. Walker in the chair, the report of the Committee being read.

It was resolved, that the same gentlemen take charge of the publication.

ADDRESS.

GENTLEMEN,—

We welcome you to this School of Medicine. No profession or association of men are united by more numerous and important ties than the medical. None feel more constantly and fully the close connection that results from common pursuits and common duties. And, nowithstanding the accidental differences and estrangements that must occasionally result from conflicting personal interests,—I suppose there is no one among us who would not, at any time, meet a stranger with more interest and cordiality for knowing that he also was a physician. That name is itself a title which at once commands our especial regard ;—and it naturally follows that just in proportion to the respect we are glad to pay to it and its legitimate bearers, is the just aversion with which we regard any one who assumes it falsely, or who degrades it by unworthy practices. You will see at once, then, that you who have come here to commence or to continue the study of medicine, must be regarded by us with feelings of no ordinary interest. You have selected, for your occupation and pursuit through life, the profession to which, years ago, we devoted ourselves. You are preparing yourselves to enter on the same field of activity which we now occupy, and you will hereafter become fellow laborers in it with us. The character and position, therefore, of the profession to which we belong, will certainly be affected in no slight degree by the kind of spirit you infuse into it. It will be elevated or depressed according as your disposition, your qualifications, and your acts tend to elevate

or depress it. I need not say how much your future personal standing in the brotherhood of physicians, and the influence you are to exert on the profession itself, will depend on the manner in which your preparatory studies are directed, and on the spirit and degree of activity with which you pursue them. This period of your pupilage must be regarded as the most important of any in respect of its influence on your professional character. When once you have passed through it, its influence is exerted, for good or bad, and cannot be nullified or easily counteracted. It cannot be lived over again, nor its deficiencies, if it have any, supplied. Not only will the number of medical facts you learn here depend on your own diligence and the faithfulness of your teachers,—but what is of still more consequence, your future *style of thinking* in medical matters, and the manner in which you are hereafter to observe and examine medical phenomena will depend, in a very great degree on the mode in which your studies are now to be carried on, and the train of ideas with which you are now to become familiar. It is no more than natural, then, that we should regard you, who are joining the ranks of the students of medicine, with peculiar interest; and that we should feel the importance of your understanding, as early as possible, the character and requirements of the study you have undertaken to pursue.

There is probably but little occasion for me to speak of the worth and dignity of the medical profession. If you were not already sensible of these, you would not have chosen it for the occupation of your lives. Still it may not be out of place here to say that further acquaintance with it will not disappoint the expectations you have formed. I do not know any profession whose members are more thoroughly and sincerely attached to it than the medical;—there are few where they are so much so. We sometimes, it is true, hear medical men complain of the unpaid drudgery they are obliged to perform, and the unjust slights and misconceptions to which they are subject; and sometimes, disheartened by the bluster and pretensions of some ephemeral but successful impostor, they for-

get, for the time, that the Profession of Medicine has a duration in the past and a security in the future, that raise it above the level of temporary disaster, and protect it equally from the passing attacks of ignorance and dishonesty. And whatever may be said of the practice of medicine by the disappointed or the over-sensitive, all will agree that its study, as a worthy pursuit for vigorous and cultivated minds, has no superior in the whole field of knowledge, open to human investigation.

Its antiquity cannot be estimated. Among the civilisations which may have flourished before the commencement of Egyptian and Indian records, and then disappeared from the earth like the extinct mastodons and mammoths, there is little doubt that systems of medicine, more or less complete, perished at the same time with other evidences of refinement and cultivation. Whenever, since then, the human race has made any intellectual progress, Medicine has always received its due share of attention. The greatest and most ancient of Epic poets that history knows* does not think it beneath the dignity of his verse to do homage to the worth and calling of the physician. Throughout the classical periods medicine was cultivated by the most active and intelligent of the times, and when the darkness of a Gothic night settled down over the face of Europe, it was preserved from destruction in the literature of the sober and studious Arabs. Since then, no science has had brighter ornaments or more devoted followers. Following Hippocrates and Galen, Celsus and Pliny and Avicenna, have come Morgagni and Malpighi, Spallanzani and Vesalius, Ambrose Paré, Harvey and Hunter, and Boerhaave and Bichat and Laennec. Do you think that such minds as these can have labored in turn for two thousand years in the field of medical research without leaving us a legacy worth inheriting? The subject that occupied them, enriched, as it is, by their successive accumulations, cannot certainly be unworthy of cultivation by us.

* Ἰητρὸς γὰρ ἀνὴρ πολλῶν ἀντάξιος ἄλλων.—Homer's Iliad, xi. 514.

If we are sometimes tempted to think that medicine has, so far, made little progress, it is only because the subject is so complicated and its extent so boundless. The avenues that it opens to us stretch out so far into the future that the space already passed over seems small in comparison. But it is small in comparison only. In every complicated department of human knowledge progress is at first slow and difficult,—opposed by obstacles, retarded by unavoidable errors, which must be corrected by subsequent examination. The pioneers of Medicine had no royal road to follow. Their landmarks were few, and easily mistaken. Their route led over intricate passes or through close and tangled thickets. Sometimes they were obliged to cross trembling and insecure morasses; and sometimes, with laborious strokes of the hammer and crowbar, they must force their way through ledges of the solid rock. What wonder is it that they were sometimes misled by false landmarks, and wandered off into impassable wastes, or were misled into devious by-paths, that carried them backward while they thought themselves advancing? Standing now on the eminence to which they have brought us, we can look back and see the windings, and faults, and doublings of their track. But if we had to begin where they begun, and to go over now the same ground, we should commit at least as many errors as they.

Let us not suppose, then, because we are sometimes obliged to discard as error what was a year ago held as truth, that for that reason all previous labors were fruitless, and we are still beginning at the beginning. That is not the case. These errors were only a part of our previous acquisition. They were the unavoidable mistakes, made in first studying an intricate subject;—and by continued perseverance they are successively sifted out, while that which is absolutely true remains behind, slowly but constantly accumulating.

We are apt, also, to regard those discoveries and achievements of Medicine which have been long the property of the profession, as less valuable in themselves than they really are. As the schoolboy, drilled into detailed familiarity with the heroes of Homer or the supernatural personages of Æschylus

and Sophocles, is incapable of appreciating the magnitude of the subject until he recurs to it at some subsequent period when the effect of this constant familiarity has somewhat worn off, so we are apt frequently to overlook the value and difficulty of many medical discoveries, because they now appear to us so simple and so well-known. Simple and well-known they undoubtedly are, now that they have been established;—but they were not the less obscure beforehand, and difficult of acquisition. "The most obvious thing in the world," says a French writer, "is what was discovered yesterday;—while nothing is so obscure as what will be discovered to-morrow."

The practice of vaccination in Medicine, and of Etherisation in Surgery are discoveries still too recent and brilliant to have yet been obscured, to any great extent, by the veil of familiarity. Yet even these have already become so thoroughly a part of modern Medicine, that we fully appreciate them only when we recollect what would have been our condition without them. Before the discovery of inoculation *one* out of every *five*, exposed to the variolous contagion, fell a victim to the disease. Now only one in fifteen hundred perishes from the same cause. Before the use of ether and chloroform, surgical operations were a different thing from what they are at present. The student who has commenced his career during the last few years, can form but a faint idea of what it was to do or even to witness a severe surgical operation previous to 1847. Then the operating theatre, from the commencement to the end of the surgeon's performances, was a scene of pain and terror. The spectator's mind was half occupied in preserving an exterior of pretended indifference, and the air was filled with the patient's screams of suffering or apprehension. Now the operating theatre is a quiet and noiseless room. The knife searches for morbid growths, entangled among nerves and bloodvessels; or the pulleys drag, by main force, dislocated limbs from their unnatural positions, almost without producing a sound or a movement that could excite the alarm of the spectator, or shock his sensibilities. Older discoveries than these seem now more common-place. The *circulation*

of the blood, for example, is no longer the exclusive property of medical science, but is a part of the popular knowledge. Almost every schoolboy is taught something about it. But we have only to remember what must have been the difference in the position of medical knowledge before and after Harvey's discovery, to understand at once its true value. Suppose, for a moment, that a new discovery, of equal magnitude with that of the circulation of the blood, were to be made at the present day. What an enormous advance would instantly be made in every department of medicine!

These advances, then, have been continuous since the commencing history of our present civilisation. Striking and brilliant conquests in the domain of discovery have been made, of course, only at long intervals; but some new facts, well worth all the labor they cost, have been constantly and steadily accumulating, enabling us to correct previous misapprehensions, and opening the way to similar acquirements in the future.

Such, then, is the science whose study you have commenced or are commencing. Let us see what are the methods we are to follow in its pursuit.

Whenever we commence the examination of a subject which is entirely novel, and of unknown character, we almost necessarily begin in the middle. Ignorant of its extent, unacquainted with its component parts, we attack the question, so to speak, at hap-hazard, knowing only that it is absolutely necessary, at first, to make an opening *somewhere*,—no detailed plan of operations being possible, until an entrance, at least, has been effected, and we are somewhat acquainted with the nature of the ground. Medicine having for its subject the causes and cure of disease, its cultivation was naturally commenced by studying directly the effect of drugs on the bodies of the sick. Then, a patient who had recovered from any illness, deposited in the temple of Æsculapius a votive offering, with a tablet describing his illness and the means by which he had been restored to health;—so that others, similarly affected, might try the effect of the same

remedy. This was a blind beginning; but necessarily the only one that could then be made. In this, as in all similar cases, it gradually became manifest that such a plan of operations, though necessary in the outset, was altogether inadequate to the completion of the work. The subject showed itself too vast, and the question too intricate. The plan of the Æsculapian tablets might be followed for ages without producing directly any scientific result worth having; because it proposes to itself the logical impossibility of a simple answer to a complicated question. Instead of being homogeneous, the science of medicine is seen to be composed of several different departments,—the simpler of which must be thoroughly understood before we can approach the more complicated with any hope of success. A certain method, or order, in our studies therefore becomes necessary; for without it, progress is impossible. The study of medicine is divided accordingly into certain distinct departments or branches, which are under the charge of different teachers, and which follow each other in a pretty natural and connected series. These are Chemistry, Anatomy, Physiology, Pathology, Materia Medica, and Therapeutics.

Chemistry lies so at the basis of medical science that it may be said to be rather a preparatory study than a part of medicine, strictly speaking. It does not, in fact, necessarily introduce us to medical studies proper. We may study Chemistry thoroughly, without knowing anything about Medicine. Still, it is so closely interwoven with nearly every department that follows—with Anatomy, Physiology, Materia Medica, and Therapeutics—it is so much more necessary to the physician than to the student of most other sciences, that it is naturally and indispensably incorporated into the teaching of a medical school. The physician is, *par excellence*, the student of nature. It is not his place to invent, to theorise, to speculate. His subject is the phenomena presented by natural bodies, animate and inanimate; and his object the modification of these phenomena, by combining them to his own advantage. The inanimate substances, that form so enormous a proportion of the mass of the globe, first

claim his attention, and it is their properties and phenomena that chemistry teaches him. He sees them present two different orders of qualities, under two distinct conditions (which are common, indeed, to all natural objects), viz.: a condition of rest, and a condition of activity. In a condition of rest, he studies their weight, their form, their volume, their color, their consistency, their composition. The drop of water presents to him a globule of a certain color, transparency, and fluidity. He weighs it and measures it. He separates its oxygen and hydrogen, and weighs and measures them. He thus becomes acquainted with its properties in a state of rest. Then another class of phenomena claim his attention—the phenomena of its activity. The quiescent fluid swells and bubbles with the elevated temperature. It flies off in wreaths of vapor that float through the air, and then condense again on some stone jar or marble slab. Or, subjected to the opposite condition of increasing cold, it becomes whitish and opaque, and solidifies into a network of interlacing crystallisation. Or, dropped on a bar of iron, and suffered to remain there in contact with the atmosphere, its oxygen seizes upon the metal, and uniting with its substance, appears under a new form as a rusty, brownish powder, that, united with muriatic acid, will again appear in a new combination, as brittle, reddish crystals, endowed with new properties, and susceptible of new transformations. Or, brought into contact with potassium, the rapidity and violence of the combination, with its accompaniment of heat and flashing flames, presents us with the remarkable phenomena to which we have given the name of combustion. All the decompositions and re-compositions, and the phenomena of electricity and magnetism, crystallisation and solution, vaporisation and solidification,—all these exhibit to the chemical student the *activity* of inanimate bodies; that is to say—the phenomena which they are capable of presenting when placed under the requisite conditions. This department of study is marked by special characteristics. It bears everywhere a definite and positive aspect, and a character of almost mathematical simplicity and certainty.

With Anatomy you cross the threshold of medicine proper.

You commence here the examination of that natural object with which the physician is more especially interested, viz.: the living body. In this first department of the science you are to learn simply the parts of which that body is composed. Just as the mineralogist and the chemist study the forms and substances met with in the crust of the earth, the water, and the atmosphere, so you study the forms and substances entering into the composition of the living frame. You study them by every available means. As you wish to become acquainted with all their different properties, you make use, of course, of different methods applicable to those different properties. You use your eyes and your fingers for the parts which are exposed and superficial, your knife and scissors for those which lie deep, or are so entangled with each other that they require to be artificially separated. You employ a microscope for those that are too small for the naked eye, and filters and evaporating dishes for those that are suspended in a state of minute subdivision, or that present the liquid form by mutual admixture and solution. Already without recourse to any instruments, you gain some anatomical knowledge from simply surveying the body. You see some of its different parts. You distinguish a head, a neck, a trunk, and extremities. You see the eyes and the ears, occupying distinct positions; and by a little dissection, you become acquainted with the integument, covering everywhere the exterior of the body. Going deeper, you find that in a single limb you can distinguish muscles and nerves, arteries, veins, bones, ligaments, and tendons. Examining other regions, you see that there are muscles there too, differing in shape from the first, but similar in structure; and you comprehend at last that all these distinct but similar muscles, distributed throughout the frame, when taken together, constitute a connected set, or order of parts—the muscular system. So with the tegumentary system, or skin; the bony system, or skeleton. To examine the muscle still further, you tear it into shreds with needles; and as, with the naked eye, assisted by knife and

forceps, you found an entire limb to be made up of bones, ligaments, muscles, veins, &c., so, aided by the microscope, you separate the entangled threads of which the muscle is composed. *There* are the inosculating tubes of capillary blood-vessels,—the delicate, but distinctly-marked nervous filaments,—the white, wavy bundles of cellular tissue,—and the ruddy, prismatic, muscular fibres, with their colorless and transparent sarcolemma, their elegant and regular striations, their concealed nuclei, and their bundles of beaded fibrillæ. When you have done this for the rest of the tissues and organs, you have done all that can be accomplished by these means. You have separated the body into the minutest forms of which it is composed. But these forms, themselves, are not simple, but compound. They are composed of a mixture of different substances which cannot at once be recognised by the eye, because they have no definite size or shape, any more than the oxygen and nitrogen of the atmosphere, but which are mutually diffused and united with each other. You must then proceed to study these more elementary constituents.

If you take, for example, a muscle, and cutting it into small pieces, soak it in distilled water, and then subject it to pressure, there will run from it a fluid with which the fibres were bathed and moistened. Heat this fluid to 160°, and it becomes turbid, depositing a curdy, flocculent substance, that was before in solution. This is Albumen. Separate the precipitate by filtering, and you get a clear, acid fluid. The acid is Lactic acid, which you neutralise with Baryta-water. *That* forms a precipitate showing the presence of Phosphates of potass, magnesia, &c. The remaining fluid you evaporate slowly, till a substance is deposited in short, needle-shaped crystals, with a brilliant lustre, a sharp taste, and neutral in reaction. That is Creatine. There is another substance remaining, which is more soluble than the first, but which is, in its turn, compelled to deposit and solidify by the advancing evaporation, or which must be seized upon and separated by some salt of copper or zinc. It crystallises in prisms, has

a caustic taste, and is alkaline in reaction. It is called Creatinine. Further on, Chloride of sodium is driven out also from its fluid concealment, and is exposed at last, like the rest. Then, with dilute muriatic acid you dissolve most of the remaining solid portion of the fibres, and neutralising with an alkali, precipitate in abundance the semi-solid Musculine. One or two other substances are extracted by analogous means, and our dissection is then complete. We have become acquainted with the intimate structure and constitution of the muscle—that is, we have studied its Anatomy.

In pursuing this, and similar examinations, we must keep clearly before our minds the object we have in view; and always remember the distinction that exists between the real subject of our study, and the means used in its examination. Let us not commit the error of regarding our subject as different, because our methods of investigation vary. Thus, when we use the microscope in examining the body, we are not studying optics, but anatomy—we are not even pursuing a branch essentially different from ordinary anatomy, but are merely using an instrument, to gain the same information with regard to the smaller anatomical forms that the naked eye gives us with regard to the larger. So the chemical manipulations used in examining the body are to be regarded as anatomical instruments only, of another sort;—and they may be used alternately, in chemistry or anatomy, according to the object we have in view. Thus when the chemist takes fibrine, and examines it as an isolated body, without reference to its origin or physiological destination, as he might examine sulphuret of iron or carbonate of magnesia; when he separates its ultimate elements and ascertains how much oxygen, hydrogen, carbon, and nitrogen it contains; when he learns what are the results of boiling it with potass, or decomposing it with sulphuric acid,—then he is studying chemistry, and not anatomy or physiology; for his whole object and aim in examining the substance, is the investigation of its purely chemical phenomena. But when he examines fibrine in its relation to the organised frame, when he endeavors to learn

under what form and in what quantity it exists in the blood, what are its properties while circulating in the vessels, and what are the modifications of these properties in different parts of the body;—then he is studying its anatomy, and not its chemistry. For the chemical operations to which he has recourse are resorted to, in this instance, simply as a means and not as an end.

All the tissues and fluids of the body, therefore, are to be examined as we have examined the muscle. Take, for instance, the blood.—For the blood is as much a part of the body as the bones and muscles, and therefore must be examined first by the anatomist. The albumen, the phosphate of lime, the chloride of sodium, in the blood are constituent parts of the frame, and therefore come within the domain of anatomy. In point of fact, as a matter of convenience in the arrangement of a course of medical lectures, the description of the fluids of the body usually falls to the lot of the teacher of Physiology;—and such will be the arrangement in the course which we are now commencing. Anatomy and physiology are so interwoven, that it is not possible for the lecturer on anatomy to avoid referring occasionally to physiological matters;—and, *vice versâ*. Still, this is of no consequence, so far as regards our present purpose. Whether the fluids of the body be treated of by one person or another, their description is in reality a part of anatomy, and of anatomy alone;—and it is necessary to recollect this, in order to avoid confusion in our ideas.

We examine, then, the blood as we have examined the muscles.—It being quite fluid, at least to the unaided senses, the knife and the forceps are of no use to us here. Instead, we first examine a drop with the microscope.—We then see that it contains semi-solid globules, of two kinds, white and red, swimming in a colorless and transparent liquid. We ascertain the size, shape, color and consistency of these globules, and then, as in the muscles, we separate by various solvents, the two amorphous substances, globuline and haematine, of which the most numerous of them are composed. Then we separate from the liquid portion, by appropriate means, first

the fibrine, then the albumen. By successive evaporations and crystallisations, we get the water, the chloride of sodium, the phosphate of lime, potass, and magnesia, the urea and other substances which, mingled together, made up its mass, Then we know the constitution of the blood, and have finished its anatomy.

Next in order comes PHYSIOLOGY.—The characters which distinguish this branch from the preceding, are well defined and important. Anatomy is the description of the body in a state of rest. Physiology is the description of it in a state of activity. We see, then, that the order in which these branches are arranged is not an arbitrary one, but natural and necessary. One must precede,—the other must follow. It is so with all the departments. But it is important to bear in mind this fact:—that, *although the first is always a necessary preliminary to understanding the second, the facts of the second cannot be, in the least degree, inferred from those of the first, but must be studied by themselves.* Thus, chemistry is essential to anatomy, because certain substances, belonging to chemistry, such as chloride of sodium, occur as constituents of the human body. Chemistry teaches us the composition, reactions, mode of crystallisation, solubility, etc. of chloride of sodium, and if we did not know these we could not extract it, or recognise it when extracted from the body. But if we knew its chemistry ever so well, we could not, on that account, *infer* its presence as a constituent of the body, nor in what quantities, nor in what situations it would present itself. These facts must be ascertained for themselves, as a part of anatomy proper. So, again, the structure of the body in a state of rest, or its anatomy, is to be the first understood; but its active phenomena, or its physiology, must then be ascertained by direct observation and experiment. No knowledge of anatomy, however minute and thorough, could ever teach us that the muscular fibre was contractile, or the nervous filament sensitive. Those bodily phenomena, even, which are purely mechanical in their nature, require the same direct

examination. The *structure* of the heart may be learned by dissection; its rythmical and complicated movements baffle all a priori hypotheses, and must be actually *seen* to be understood. This is not because they are at all obscure or mysterious in their *nature;* for they are, as I have already said, purely mechanical in character; but because their conditions are so peculiar, owing to the tortuous course of the fibres, their arrangement in interlacing layers, their attachments and relations, that their combined action produces an effect altogether peculiar, and not similar to that which is observed anywhere outside the living body. Many of the phenomena of life are chemical in their character: There are combinations and solutions, decompositions and re-compositions; but these, again, cannot be inferred from any previous chemical knowledge, but must be ascertained for themselves, as they take place in the organised frame. No other plan of investigation will succeed, because many of these reactions do not take place, and cannot be made to take place anywhere else. This, again, is not because there is anything particularly mysterious or extraordinary in their nature, but because the conditions, necessary for their accomplishment, are met with in the body, and not elsewhere. A difference in the surrounding conditions will modify the simplest chemical phenomena. If a hot concentrated solution of sulphate of soda be allowed to cool in contact with the atmosphere, it chrystallises; covered with a film of oil, it remains fluid. Sulphur, which solidifies at a temperature of 232°, crystallises in oblique prisms; below that point, it crystallises in rhombic-based octahedra. It is plain, then, that we cannot foretell, from our knowledge of the chemical reactions of a substance outside the body, what will be its reactions in the body; since the conditions under which it is placed are new.

Ferrocyanide of potassium and perlactate of iron, by mutual decomposition, produce Prussian blue. But if the lactate of iron, be injected into the right jugular vein of an animal, and ferro-cyanide of potassium into the left, so that they may meet in the blood, no Prussian blue is produced. The serum

of the blood holds both salts in solution, and yet they do not act on each other; because there exists also in the serum an organic substance, which by its presence prevents their usual reaction. If this organic substance be destroyed by a few drops of sulphuric acid, then the two salts are at liberty to act on each other, and the Prussian blue is immediately produced.

If a solution of cyanide of mercury be injected into the femoral artery, it returns unchanged by the femoral vein, and the animal suffers no inconvenience. But if injected into the vein, and carried through the heart to the lungs, it destroys life in less than a minute; because in the tissue of the lungs it meets with a substance by which it is decomposed with the production of hydrocyanic acid, that poisons at once the nervous system, and stops the action of the heart.

Such facts as these give us an idea of the peculiar delicacy and complexity of the phenomena which we meet with in studying Physiology. Singular as it may seem, there is a tendency in some minds to ignore this complexity in the phenomena of life,—to push it out of the way, even, and cover it up, as if it were a stumbling-block in the path of science, instead of being, as it is, an essential fact, to be recognised and studied like any other. I could name more than one physiological writer, whose whole endeavor seems to be to reduce the science, as it were, by force of arms, to a series of simple propositions, which do not express its real character. They attempt to square physiology on the pattern of other sciences, instead of taking it as it really presents itself, and in studying it as chemistry and physics, they forget to study it as physiology. A single example will make my meaning in this respect more easily understood. It is well known that a certain amount of sugar is constantly introduced into, or produced in the body; and that, as it enters the blood, it is destroyed and disappears as sugar, passing through a series of transformations, the details of which are not altogether understood. In Diabetes, this sugar, for some cause or other, is not destroyed as it is in health, and accumulates in the blood—making its appearance, consequently, in some of the

secretions. Some years ago, the chemist Mialhe observed that when sugar was boiled with a solution of potass, it was destroyed under the influence of the alkali, losing the properties of sugar, and becoming converted into a brown substance, known as melassic acid. Observing also that the serum of the blood was alkaline, he concluded that it was by this alkali that the sugar was naturally destroyed in the circulation; and that when the alkalescence of the serum, from any cause, was insufficient, all the sugar could not be destroyed by it, and therefore accumulated, producing the condition of Diabetes. He observed, in this instance, what took place in the test-tube, and from that inferred what took place in the blood—forgetting, by some inconceivable fatality, the essential difference between a solution of caustic potass, at the temperature of 212°, and the slightly alkaline blood, composed of twenty different ingredients, at the temperature of 100°, and circulating in the vessels of the living body. His conclusion was worthless, as the expression of a physiological fact, for the simple reason that, in the body, the sugar is *not* boiled with caustic potass, but is subjected to other influences. The destruction of sugar by boiling potass, on which he based his theory, is a purely chemical fact, of a certain degree of importance, and extremely interesting to know; but it is not a physiological fact, and he was not, as he supposed, studying Physiology.

Let us not, then, commit the mistake too commonly made, of taking it for granted that things will be in the body as they are in the test-tube and crucible. We cannot tell whether they will be so or not, until we look and see. If we persist in regarding the organised frame as a furnace or a filtering-jar, and its actions as identical with combustions and filtrations, we may amuse ourselves with introducing into Physiology an imaginary simplicity, but we shall make no progress in positive knowledge. If we wish to study the structure and growth of sea-weed, we do not look for it in fresh water. If we wish to study the functions and phenomena of life, we must search for them in the living body, and

in the living body alone—take them as they are, and not compare them with other things which are dissimilar.

Pathology is the natural history of disease. It is the study of the unnatural phenomena of the living body produced by the operation of morbid influences. It is almost a truism, then, to say that we must first be acquainted with the natural processes, before we can understand their deviations. But beside this we must study independently the deviations themselves, without attempting to deduce them from the natural phenomena. Physiology throws no light on pathology. It is very true, as I have already said, that it is a necessary preliminary, and if we try to get on without it, we shall succeed only in wasting our time. But it is a necessary preliminary only. It brings us up to the threshold of pathology; —it does not carry us over it. The pathologist must study the body in disease, just as the anatomist and the physiologist have studied it in health. His means and methods are the same, his subject only is different. There is no organ or function of the diseased body which is not subject to his scrutiny; no solid or fluid that he is not to dissect and analyse. All this is to be done without reference to any future and different order of studies. The disease is first to be investigated without the least reference to curing it. It is to be studied as a natural phenomenon, like the eclipses and the spring-tides. I cannot too much ask your attention to this fact, for it is one that has exerted, and is exerting, much influence on medical science. There is no particular in which the medical profession have made more rapid and satisfactory improvement during the last twenty years than in their way of thinking on this point. Physicians are now awake to the necessity of knowing something about the disease in its natural, undisturbed course, before they undertake to treat it. Formerly, a sick man was a man who required to take medicine. Fever was defined to be something that demanded bleeding and sulphate of magnesia; and, in the mind of the student, cholera infantum was instantly associated with calomel or hydrargyrum cum cretâ. Physicians, however, began to see at last that

this was a confused and unsatisfactory method;—and that the smoke of this senseless cannonading blinded their own eyes, and really prevented their seeing what they might have learned by simply keeping still. Then pathology began to take its proper place as one of the departments of medicine. Medical men soon comprehended that diseases have a natural history, like the different ages of man, or the different species of animals. They originate at certain times, in certain places, under certain conditions. They announce themselves by certain symptoms, insidious or violent. They pursue a certain course, steady or fluctuating, tedious or rapid. They are liable to certain accidents, relapses, and complications. Many of them terminate in a certain number of days, or weeks, or months. A few are as deadly as poison, some imply no danger to life,—most of them are distinguished by a certain preponderance of the favorable or unfavorable chances, which are now in a great measure estimated for each one.

These are the topics which will occupy you as pathologists. We must recollect, also, that what we mean by a disease is only a morbid condition of the functions, as health is a natural condition of the functions. It is these functions, therefore, the active phenomena of the diseased body, which deserve and require our attention; and not any imaginary force, or entity, which will always necessarily elude our observation. There is no such thing as a *pneumonia*, properly speaking. A man with pneumonia is a man whose skin is hot, whose pulse is rapid, whose lung is inflamed, whose respiration is hurried, and whose expectoration rusty and adhesive. Pneumonia, so far as its derivation is concerned, means inflammation of the lungs. But inflammation of the lungs is only one of the morbid conditions under which the patient is laboring.—There are also the alterations of the pulse, the temperature of the skin, the secretions, &c. You will say, perhaps, that these are secondary, and all dependant on the inflammation;—but that is the very thing of which we are ignorant,—whether the alterations referred to *are* so dependent on the inflammation, or whether they are all dependent, inflammation

as well as the rest, on some other cause, not yet known to us. The name, pneumonia, which we give to this collection of morbid conditions does not represent anything positive. It is simply an intellectual artifice, by which we keep these conditions associated in our minds, and are enabled conveniently to communicate them to others. Do not suppose that these are fanciful distinctions, interesting to the metaphysician, but of no practical importance to the medical man. They are real distinctions, of the first practical importance. That they are real we can see at once, by referring to the history and nomenclature of various other diseases. Dyspepsia, for example, means only a collection of symptoms, the most constant and prominent of which is a disturbance of some kind in the process of digestion. No intelligent physician supposes it really to represent any distinct disease. Every one knows, on the contrary, that it comprehends several different morbid actions, of which one may have its seat in the stomach, another in the duodenum, another in the jejunum, and a fourth, perhaps, in the ileum. We are not yet sufficiently acquainted with the distinctive characters of these affections, to give them their proper titles; and it is therefore from our ignorance, and not from our knowledge, that we name them all Dyspepsia. Before Laennec and Louis lived and wrote, all inflammatory affections of the thoracic organs were known by the name of inflammation of the chest;—simply because physicians were unable to distinguish them during the life of the patient.—Now, with better means of diagnosis, we know the difference between pleurisy, pericarditis and pneumonia. But shall we stop here, and rest satisfied, thinking we have followed the thread to its termination? Yes,—if we believe the term "pneumonia" means something positive and definite, and expresses the real character of the disease. But not so, if we take it for what it really is,—a word, used for the sake of convenience, and nothing more. We always find that the simpler departments of medicine, preceding in the natural course of study the more complicated, are actually farther advanced than they at any one period of time. Thus, ana-

tomy is now more complete than physiology,—physiology than pathology,—pathology than therapeutics. And as pathology itself has two parts, one corresponding to anatomy, the other to physiology, it is not surprising that its anatomical part should be the more complete of the two. The actual changes that go on in disease,—the unnatural combinations and decompositions, we know little or nothing about. We do know something of the alterations in the constitution, i. e. the anatomy, of the fluids. We know that in some diseases the blood has more fibrine than is natural, in others less globules. In some that it contains an abundance of sugar, in others that it is deficient in salts. But we are much better acquainted with the altered structure, or the morbid anatomy of the solids. These, being more easily examined than the fluids, naturally first received the attention of pathologists; and in this particular our knowledge is already remarkably complete. As the alteration of the solids, then, in color, consistency and texture, is apparently the most essential element of disease with which we happen to be acquainted, we naturally derive our nomenclature, whenever it is possible, from these data of morbid anatomy. We have consequently induration and softening of the brain, pulmonary tuberculosis, cancer, local and general, gastritis, nephritis, hepatitis, etc. We call a disease pneumonia, because in it the lung has undergone the inflammatory induration. But in all probability there are other changes, particularly in the constituents of the blood, dating anterior, perhaps, to the pulmonary inflammation, which are not yet understood, but which are certainly indispensable to a real knowledge of the disease. These will also be understood in time, as pathology continues to advance, and then we may hope to learn something of those active changes, those disturbances in the continuous movement of union and decomposition, of nutrition and disintegration, incessantly going on in every solid and fluid of the body, that really constitute the essential processes of disease.

We come at last to THERAPEUTICS, or the *cure of disease*.

This is the end and aim of all our studies, the goal of all our exertions. We are to learn to accomplish this by every means and appliance in our possession. And as these means and appliances consist largely of medicines, vegetable and mineral, our first care is to study these medicines by themselves, so as to become thoroughly acquainted with the instruments we are to use. This branch is MATERIA MEDICA. —Men have always had, and always will have an instinctive faith in the power of drugs. This power is not to be questioned. Drugs will excite or depress the nervous energy. They will paralyse or irritate the muscles. They will modify profoundly the nutrition of the whole body or of particular parts. One, rubbed on the skin of the forehead, will dilate the pupil. Another, taken into the stomach, will depress and retard the movements of the heart. Another, introduced gradually into the system, will produce a pustular eruption about the face and neck; and a fourth will relax the extensor muscles of the hand, and send neuralgic pains through the trunk and extremities. Nothing is more natural, then, than to believe that substances which act so powerfully on the healthy frame, may be used to advantage in modifying the processes of disease. But we must in the first place, learn their physical and chemical properties, their commercial history, the adulterations to which they are subject, and the means of detecting them. It is particularly indispensable, too, to know their action on the healthy body, in different quantities, and under all the varying conditions of age, sex, temperament and constitution. Once thoroughly acquainted with our instruments, we can then passto the study of their use.

In commencing Therapeutics proper, we are more deeply sensible than ever of the necessary connection and enchainment of the different departments of medicine. We have arrived now at the most complicated; and we see how all the others form a basis upon which it rests. We know the structure of the healthy body, and have studied its active phenomena. We understand to a certain extent, its morbid actions; and we are familiar with the effect of drugs on it in a state of

health. Now we are to study the mode in which these drugs modify its morbid actions, so as to bring them back to a healthy condition. Plainly, this is a problem, complicated though not inextricable; and one which demands that we should bear constantly in mind all the necessary preliminaries. Keeping these in view, we proceed farther on, to the study of Therapeutics by themselves. The results, again, of this study must be worked out by direct observation, and cannot be deduced from any knowledge previously acquired. We must, it is true, know the action of drugs on the healthy body; because, without such knowledge, our direct study of their action on the morbid functions would be blind, and lead to no definite result. But this direct study is not the less indispensable. Because a particular drug produces atrophy in a healthy organ it does not follow that it will produce atrophy in that organ when inflamed; because the actions on which it operates are different in the second case from what they are in the first. Therapeutics, then, presents no exception, in this respect, to the rule that governs the other departments.

We see the necessity, also, in Therapeutics, of regarding the disease as what it is, viz.: a group of morbid actions only,—and of studying the effect of drugs on these morbid actions. Otherwise we shall run the risk of mistaking the value of certain facts and methods, and of making them useless or injurious, when, properly estimated, they might have been sources of advantage. Take, for instance, the numerical method, at one time so much in vogue as a means of investigation—valuable if confined to its legitimate objects, but a source of error if it be taken, as it sometimes is, as an undeviating formula, by which all questions in Therapeutics are to be settled. According to this plan, to learn how to treat pneumonia, we collect a thousand, or, if possible, five thousand cases of it, and count the results of a certain mode of treatment; adopting or rejecting it accordingly. This would all be right if "pneumonia" were really the subject of our study in any particular case. But it is not. The subject of

our study is a particular group of morbid actions, and it is upon *these* our treatment is to operate. Do not suppose, because two men have inflammation of the lungs, that they are necessarily in the same condition. And if they are not in the same condition, the effect of drugs upon them will be different. Let us attend, then, to the real actions of disease, and not be misled by a name which only represents them. Otherwise we shall be obliged, as the French would express it, to take our pay in words, and the realities will escape us.

We see, then, why it is that so much judgment and caution are required in the practice of Therapeutics, and why the careless observer is liable to so many mistakes and disappointments. Medicine is said to be an uncertain science, and the action of drugs variable. That, however, is not the case. Under the same conditions, a drug will always have the same effect, just as surely as the sun rises and sets. It is the conditions which vary in different cases, and these conditions require to be distinctly understood and compared with each other; for in no other way can we arrive at any definite result.

You will find, in continuing the study of Therapeutics, that physicians at the present day give but very little medicine, in comparison with what was customary many years ago. This is not, as I have already intimated, because they have lost, in any degree, their confidence in the power of drugs, but because they have become convinced that the previous methods of investigation were, to a certain extent, erroneous, and not likely to produce a satisfactory result, so long as every unknown disease was at once attacked with a multitude of unknown remedies, the operation of which tended rather to perpetuate our ignorance than to dispel it. Now, retracing our steps so far as they have been made in a wrong direction, we are endeavoring to attain the same end by a different and more practicable route. We now feel the necessity, on undertaking the care of a patient, of making

our *diagnosis*, clear—complete, including every circumstance that shall throw light on the actual condition of the patient. This is, at present, the most important work that the practical physician has to do; and it is his way of doing it that more than anything else distinguishes the good from the inferior practitioner. That done, his next object is to be sure and not injure the sick man by unnecessarily meddling with him, or by allowing him to be exposed to accidents and imprudencies that would tend to aggravate his original difficulties. Beyond that, he uses few drugs, because what he does employ he wishes to use in an understanding manner, and with his eyes open—not blindly, or at hap-hazard.

Such, gentlemen, is the plan we are to follow in the course which begins at present. I have occupied your time in discussing it somewhat in detail—being fully convinced that the *method* according to which scientific studies are to be pursued, far from being a matter of indifference, is of real and practical importance. A good method will do much to simplify and facilitate the student's labors; a bad one will certainly be the source of delay and perplexity. Especially necessary is it to have a distinct idea of the true direction and limits of our study in any particular department, so that we may not be led to demand of it more than it can accomplish, or apply it to purposes for which it is not appropriate.

Nothing now remains for me to say but to repeat the welcome with which I commenced, both to you who will engage with us in the labors of the coming winter, and to those also who have come here this evening to encourage us by their presence, and to testify their interest in the great science of Medicine. These halls, which for eighteen years have been devoted to the pursuit and teaching of that science, are about to be abandoned now for a more convenient and appropriate situation. The Institution that occupies them, however, while changing its locality, will in its character remain the same. That Institution claims to be catholic and liberal. Devoted to no clan, or sectarian idea—jealous only of move-

ments that threaten the purity and dignity of medicine—its highest ambition is to represent the feelings and maintain the interests of the Profession. May it continue in the same ambition. And may it always remain hereafter, as it always has been, in character as well as in name, the

College of Physicians and Surgeons.