LECTURE.

INTRODUCTORY TO THE COURSE OF 1868-9,

IN THE

MEDICAL DEPARTMENT

OF THE

UNIVERSITY OF NEW YORK,

BY

HENRY DRAPER, M. D.,

PROFESSOR OF PHYSIOLOGY.

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The pleasant duty of bidding you welcome to the Medical Department of the University of New York, has fallen to me this session. Among you I recognize many rendered familiar by a persistent attendance last winter; some who though graduates, desire still far ther to pursue the advantages offered, while a large number are but recent acquaintances, or else are the kind friends of the Institution. To all the Faculty give hearty welcome.

And as a medical atmosphere surrounds us at the moment, let us use the minutes we have to spend in company with one another this evening, in looking at what is before us for the winter's work; why it is that we are going to be five months together; what you have a fair right to expect, and what we ought to give? To the student such information cannot fail to have interest, while to the non-professional hearer it will lend a clue to the mysteries of the supposed "awful doings" in a medical college.

The ground work of a medical education is to be given and received. You are to learn how the disordered actions of the human machine are to be recognized and remedied, and the principles on which repairing is to be conducted, as well as the detail of execution. How are we going to carry out this plan?

The study of medicine is divided into two parts, theoretical and practical; or principles and their application. In the course we follow, the former is that which has first to be attained, and then the latter comes naturally to be grafted upon it; just as in a garden, the sound stock receives the applied scion, and eventually brings forth the perfect fruit.

We have to lay a basis of general information, or rather to superadd, to that which you have already acquired, certain additional branches. A student has something more to do in a medical college than merely to learn the names of a number of diseases, their most prominent symptoms, and as is popularly said, "what is good for them;" he must acquire as far as may be a knowledge of the why and wherefore. The common idea, that a doctor is a walking prescription book, must not be true of you. Medicine is unfortunately only too empirical, too prone to doing without a reason, for us to sacrifice the exact knowledge we have. We see but too frequently a new remedy discovered, which is given for every kind of unmanageable complaint, as for example, iodide of potassium at the

present day. If it does good, well; if not, we are no worse off than before. It cannot do the patient any harm, the baffled practioner says.

Let us then look at our medical college course and see of what it consists, and what chance it has of fulfilling your expectations. Chemistry, anatomy, and physiology are the basis, and have to be studied to a large extent at first. *Chemistry* declares to you the principles that rule living, as well as dead or inorganic matter; and though it may be sneeringly said, that no chemist can, with his boasted science, form from dead matter even the lowliest organism and impart to it the Promethean fire; we acknowledge that we are but beginners and bunglers in the laboratory of the great Arch-Chemist. Why should we not try to do what we may? Why should we disparage our own intellects and say, "I cannot comprehend this—it is meant to be an impenetrable mystery—my profane eyes have no right to peer into the secrets of Omnipotence." We have a brain, and the desire of knowing; let us apply ourselves, investigate, and know all the knowable; the total is small enough.

The medical student, without such dissuasion, is only too apt to make the mistake of supposing that chemistry is altogether disconnected from true physic, and that he must study it because one of the seven professors, before whom he has to pass an examination for his degree of Doctor of Medicine, teaches it. But he will find, as he gains a deeper insight into the subject, that chemistry lies at the bottom of the explanation of many of the most complicated, as well as of the simplest, phenomena. Dismiss from your minds the obsolete idea, that all the operations of the body are of the so-called vital kind, and ruled by a different series of laws from those which maintain in the exterior world. That is only a relic of times when to everything not plainly understood, a mysterious cause was attributed, when not only the planets required their guiding angels, but every alchemical operation involved the captivity or liberation of refractory spirits, and a compact with the devil.

I shall have during the course to show you the bearing of chemistry on our race, and to prove that man himself, from one point of view, bears a most essential resemblance to other machines for evolving power. Apparently a permanent organism, he is in a state of perpetual change; no part of him is free from continued wasting away, and as continued replacement. His aspect of material identity is all a delusion, for in no two consecutive moments is he the same. The body he had a moment ago is not the body he has now, and long before the commonly supposed seven years are out, he is, with trifling exceptions, over and over again, renewed. In a single year enough material enters the body to build it up a score of times, and the life of an old man, therefore, represents the form that more than

100 tons of matter have assumed. His actions have been the transmutations of the light and heat derived from the sun by that matter when it became a part of plants. Man is an ever changing mass of substance, consuming away and turning into smoke and ashes, and according to the very laws that hold for a piece of wood or lump of coal, under similar circumstances. The graceful figure, gentlemen, you may have clasped in your arms—the form of the fair one to whom you may have sworn eternal fealty and affection, is as fleeting as the kiss you have pressed on her lips. You are forsworn in the moment of taking your oath—you have grasped but a shadow, as transitory as the flame of a candle.

At the same time that chemistry gives such explanations of the general principles ruling animal bodies, it descends to a variety of practical applications, enabling us by the examination of the fluids to detect disease, and in many instances, to point out the remedy.

Anatomy, in its turn, treats of the relations of the parts of the body one to another. Taking the bony framework as a basis, and pointing out its component parts and their peculiarities, it lays thereon the muscles, fascia, fat, and skin, and indicates the devious course of arteries, and veins, and nerves, and the position of the various organs.

Though the path through which you have to pass in making a practical acquaintance with this branch may disgust the senses at the first sight, and seem to shock the moral feeling in desecrating the temple of the soul, yet you will soon find an enchantment in the work of the scalpel and forceps, and be only too likely, little probable as the uninitiated may deem it, to neglect other things for the fetid and dangerous table of the anatomist.

Physiology will bring before you the minute structure of parts and the function of the various organs. It will show you how a morsel of food taken into the mouth is on the eve of passing into a beautiful laboratory, which the delicate operations of a chemist may mimic, but not equal, in its exquisite actions. Ground, as in a mortar, by the teeth; acted on by potent acids and alkalies in the digestive system; filtered through fine-pored membranes, and suffering in its purified state farther chemical changes, it becomes eventually a part of the body; but only, so to speak, for a moment, for having reached the highest point it is to attain, it cannot remain still, but starts in a retrogade metamorphosis, yielding up the power it held, till it returns to the simple binary form of water, carbonic acid, or ammonia, once more, rejected from the system, under the eye of the sun to be reconstructed through a plant form into fit food for man.

It will show you how the body, like a fire, has its inward coming draughts of air and its outward going rush of burnt products,

whether as gases, liquids, vapors or solids, and how in the glow of fever or in the icy cold of cholera, the similitude is still kept up, just as the smith gains a more fervid heat by forcing more air upon his coal, or damping the fire, causes it, almost extinguished, to smoulder away unseen.

It will point out to you beautiful mechanisms, taking advantage of every needful physical principle to keep up a perpetual intercommunication throughout the body, a system of ramifying canals to carry the destroying oxygen and the repairing nourishment to every part, and to remove away the wasted products of decay. We may boast of our railroad and canal and river and road communication through the body politic of this United States—that every city and town and village is chained to the great centres—that our telegraph can speed a thought with infinite rapidity throughout the whole—yet where does that completeness stand when we reflect that the foot of a fly cannot touch the skin without the knowledge of the sentient brain, and that the minutest needle prick will penetrate with certainty our system of blood vessels The eye, the ear, touch, taste, and smell each in its turn, will instruct and elevate our minds, and lead us to graver reflections on the relation of man to man, and to the aggregate of human particles we call society.

Such are the groundwork branches of the study of medicine. Make yourselves familiar with them, for without these no man is fitted to treat the disorders of the complicated machine we have to deal with. As well might the savage, who cannot distinguish a cogwheel from a spangle, attempt to regulate the rate of a delicate chronometer.

But you may say that in all these branches there is much that is of no practical use, and that you do not want to burden your mind with it. Remember that a man cannot recollect just the isolated facts he wants. To be of use they must be strung on a theoretical thread, that by their connection we may bear them in mind, as reasoning beings should do. And do not in your studies insist too strongly on knowing only what is practical; what will turn into dollars and cents. Know a little for the sake of knowing, and have a refuge in yourselves from the cares of every day life. Be able to rise above the petty torments of contact in the world with others, to something which will calm the mind, and give the mental rest you need for fresh struggles.

The fatigued brain, overloaded in any part by the ever recurring impressions of a single train of thought, must have a rest, and one would think, to be repaired, must cease to work a while. But, singular anomaly, rest to a portion of the brain does not come as to the body with "Tired Nature's sweet restorer," but with the working of another part. A balance, an equality of action must be kept

up, or even had we the brain of Newton, his fate, insanity, must overtake us. The busy mind must turn to some other, it may be trivial object; and hence we see great men delighted with the gossip of the family circle, and Cincinnatus digging in his garden.

Do not however think, that I would ask you to become triflers or visionary theorists. Be fully developed men, able to use not one, but all the faculties you have, and not confined in a narrow circle of everyday duties, repeating like an ant or bee the doings of your predecessors.

But to continue with the course the college presents before you. The first-session student having given a large share of his attention to the above topics, should subsequently finish grafting thereon the application of the facts learned. He will be taught by his professor of materia medica, the origin, appearance, and properties of medicinal agents, their actions in the body, in health, and disease. The professors of practice of medicine, surgery and obstetrics, will show him how to detect the seat and nature of disorders, together with the results of the multitudinous accidents men are liable to from the budding moment of life, till the last agony shows the futility of farther effort.

In the old time, it was substantially at this point that the student was left when he graduated from college, and went out to fight disease. Often he was alone, and had to depend on his own information. I have heard a distinguished practitioner say, that when he first graduated, if any one approached him with the air of wanting advice, he would feign to have important business elsewhere, so as to get out of the way.

By the newer system, the student acquires confidence, because he is forced to make out cases for himself, and yet, under the direction of those who can both aid and criticise. This University was the first institution in the country to inaugurate the system of bringing sick persons before the class in Clinics, which has now become so important a feature of medical education. In them the student can see the practical application of the principles he has learned, and become familiar with minor diseases, as well as with those that are more severe. Clinics, combined with a proper amount of hospital practice, which gives familiarity with the gravest disorders and accidents, and yet need not convert a man into a mere sight seer, bind the theoretical principles in the brain.

And yet you must not believe that at this point, you will become perfect physicians. Something more is necessary than that your friends should call you doctor, and that the well-framed diploma, with its mysterious sentences, should look down from the office wall on the bewildered patients. Something more than bottles with alarming contents, which seem to indicate your skill; tumors, and

deformities of people you never saw, or the freaks of nature in the young of our own species. You must have experience. This is, perhaps, most rapidly obtained by becoming a member of a hospital staff, though that is apt to lead to routine and ignorance of the minor complaints, on which, often enough, future success depends. A connection with an older practitioner, who can give you the fruits of his experience, and furnish you with the digested results of years, will be most valuable to you.

Above all, do not fancy that you are going at once to reap the result of your short studies, and spring into practice by means of a capital operation. That result is only certainly to be reached by continued application, and as far as chance is instrumental in such matters, a knowledge of why babies squall is far more likely to help you.

When your medical education has reached thus far, one reflection will force itself upon you, the immensity of the subject, and the impossibility of being a proficient in all its branches. To those of you who intend to make the country their sphere, such reflections must be curbed as best may be, for justice to the community you practice upon, demands that you should be prepared to combat all diseases you may meet. But in the larger towns, a man may without impropriety, give almost all his time to any branch he feels best fitted for. Indeed, it is only through the effort of the specialists, that advance can be hoped for, and he who lives at a distance from the centres of thought, must make himself familiar with what others are doing, instead of depending on himself to do everything. Do not let the oppressive drudgery of practice force you into stagnation, but keep up to the times. Have a hobby if you must, my country brother and general practitioner, but do not ride it to death. You cannot be a specialist, or you will be like the doctor, who, when called to a case of colic in a child, said "give it this powder, it will produce fits. I know nothing about colic, but I am death on fits."

Such is the course, gentlemen of the first session, which we shall lay before you. To our friends of last year, the second and third course students of this, there is little to be said beyond the word of welcome. We are glad to see you, and will do our best to conduct you successfully to the end. We lay before you the mental pabulum, you have only to consume it, and make ready to combat disease. "Combat disease?" I had better say, "Aid nature," for you will find that that change is necessary in the old formula. A generation ago, the idea of the physician was, with lancet and blister, and syringe, and pill-box in hand, and heavy reinforcements to the same in his saddle-bags, to attack disease in its stronghold, and expel it at any cost. The strength of the patient was sacrificed, so that many a one fell from weakness, who would, if unmolested,

have gotten well of himself. Tedious convalescence, profitable to the physician incidentally, was a common occurrence; but the sum total of advantage derived by the patient from his medical attendant, was far less than it is now. The great principle that a multitude of diseases have a tendency to get well of themselves in a definite time, and that in those cases, the duty of the physician is merely to sustain the patient, and relieve annoying symptoms, was not recognized. Bleeding in such diseases as typhoid fever, for example, with the object of checking the violence of the disorder, took away from the patient valuable substance without affecting the duration, excepting in those cases only too frequent, where death followed when the tissues called in vain for the materials they must have, and failed to get them.

This system was the cause of the great spread of homœopathy, for that was really an expectant school of medicine, amusing the mind of the patient with the idea that he was taking physic, and giving him that which had no curative virtue. You will find that you too, are sometimes forced unwillingly to take this disingenuous course, and minister to the mind diseased, for the sick man will insist on taking something, whether he needs it or no. The harmless placebo, though distasteful to you, may, perhaps, be justified on the ground, that your object is to cure the patient, and that may only be done when his mind is satisfied.

But far be it from me to advise you to practice homœopathically, and recognise such absurdities as "Similia similibus curantur," or "A medicine is stronger in proportion as it is diluted." These will not bear the test of reason for a moment, and though it may be urged that small doses of calomel are more efficient than large ones in producing a constitutional effect, what would you say of one who expected to cause an epidemic of cholera in this city by throwing an ounce of Epsom salt into the Croton Reservoir?

There are, however, many disorders which require the active interference of the physician, and in which rest and attention to diet do not suffice. Perhaps no group shows this more plainly than the miasmatic fevers, such as the common chills and fever. Here, by fortune, we know what weapon to use, and although the properties of bark, or more truly its alkaloid, quinine, were discovered by accident, yet a sound reason for their appropriateness is, according to Dr. Bence Jones, now known. Quinoidine, an organic substance, closely allied to quinine chemically, exists naturally in the tissues, and it has been suggested that its absence is the cause of the disease spoken of. Dr. Jones finds quinine in the tissues three hours after it has been taken into the stomach, while one of our graduates, Dr. R. B. Maury, shows that to get the effect of the drug quickly, and with the least amount, you should put it under the skin, so that the

lymphatics and the capillaries may rapidly transmit it to all parts. Quinoidine appears to be furnished under ordinary circumstances, from the wine and vegetables eaten.

Assist nature, then, whenever you can, and combat disease whenever that seems needful. Even in such diseases as pneumonia, the former advice can be taken, and results far superior to those by the combative treatment reached.

And always aim at ascertaining the nature of the disorders you are called upon to treat, what their origin, and how they are producing their morbific effect. A great step forward is being made, in ascribing to low vegetable and animal forms, a series of effects hitherto unaccounted for. But you may say, of what interest is it to know that? where are its bearings on the sufferings of humanity? Why should we care about the microscopical or chemical cause of diseases? Let me put before you a case in point. The patient, a man of standing and wealth, seemed to have every thing that could be desired, and that money or influence could procure. Yet he had carried with him for forty years a perpetual torment. His skin was affected with a persistent itching, all the time getting worse, until life was about to become unbearable. Numbers of prominent physicians had been consulted both here and in Europe; no eruption was visible, aud no correct idea of the complaint was attained. All kinds of treatment were tried, all kinds of variation in diet, abstinence from this, eating of that, baths of many varieties, and yet no relief. At last the suggestion that a microscopic vegetation was at the bottom of it, caused the application of corrosive sublimate, an agent destructive to such plants, and, as if by magic, he was freed from his annoying parasite. What do you think the effect of such a case in your practice would be? What wonld be your standing among your compeers? or to take the dollar view, what would the public think of it? And yet how natural when the cause was known to apply such a remedy.

Again, in the case of cholera, a cryptogamic or fungous origin has been suggested, and if this be true, appropriate remedies will no doubt be ere long invented, to prevent their access into the system, or to cause their destruction when they have entered. In the case of the poison of the Australian black snake, which acts with a similar rapidity, it has been shown by Dr. Halford, that the venom really owes its poisonous qualities to the implanting of certain peculiar cells in the blood, where they multiply with great rapidity, and at the expense of a constituent of the red blood discs. If the life of the patient can be sustained till these have exhausted the ingredient theymust have from the blood, he gets well, and the disease disappears with the death of the germs. Now what is more natural, knowing these facts, than to look for a substance which may destroy

such cells, and yet not kill the patient? It seems that alcohol fulfils the condition very nearly.

Medicine, though at present very far from being an exact science, must sooner or later take that rank. It is your duty to aid all that you can in the progression forward. Do not give way to the idea that the operations of the body are too mysterious ever to be explained. Every day they are having a new light thrown upon them, and chemistry and mechanical laws, and the application to our case of the simpler operation of the lower animals, are forcing explanations upon the unwilling. That the saliva is a fermenting juice, acting on the starch and sugar we eat, just like so much yeast; that the gastric juice is concerned in a purely chemical operation, adding atoms of water to albuminoid bodies, and making them peptones; that respiration is for a purely chemical purpose, the causing of combustion and liberation of force in the body; that circulation is an affair of capillary attraction in large part; these well established facts show the way forward to the explanation of a multitude of functions now totally inexplicable.

Hear what Simpson, a distinguished and progressive physician, who has been knighted for his attainments on the other side of the water, says of the future of the healing art: "But that day of revolution will not probably be fully realized till those distant days when physicians—a century or two hence—shall be familiar with the chemistry of most diseases; when they shall know the exact organic poisons that produce them, with all their exact antidotes and eliminatories; when they shall look upon the cure of some maladies, as simply a series of chemical problems and formulas; when they shall melt down all calculi, necrosed bones, etc., chemically, and not remove them by surgical operation; when the bleeding in amputations and other wounds shall be stemmed, not by septic ligatures or stupid needles, but by the simple application of hæmostatic gases or washes; when the few wounds then required in surgery shall be swiftly and immediately healed by the first intention; when medical men shall be able to stay the ravages of tubercle, blot out fevers and inflammations, avert and melt down morbid growths, cure cancer, destroy all morbific organic germs and ferments, annul the deadly influences of malaria and contagions, and by these and various other means markedly lengthen out the average duration of human life; when our hygienic condition and laws shall have been changed by State legislation so as to forbid all communicable diseases from being communicated, and remove all causes of sickness that are removable; when the rapidly increasing length of human life shall begin to fulfil the ancient prophecy, 'the child shall die an hundred years old;' when there shall have been

achieved, too, advances in other walks of life far beyond our present state of progress; when houses shall be built and many other kinds of work performed by machinery, and not by human hands alone; when the crops in these islands shall be increased five or ten fold, and abundance of human food be provided for our increased population, by our fields being irrigated by that waste organic refuse of our towns, which we now recklessly run off into our rivers and seas; when man shall have invented means of calling down rain at will; when he shall have gained cheaper and better motive powers than steam; when he shall travel from continent to continent by submarine railways, or by flying and ballooning through the air." Now what is there impossible in all this, when you remember what this century has done?

If you feel the necessity for relaxation, when your labors permit, let me earnestly advise the study of the connection, mentioned a few minutes ago; that of the lower animals with ourselves. There is the key to a knowledge of much that is mysterious, for in the lower animals, those experiments made by nature for us, as Cuvier called them, you will see the simple form, and detect the elementary principles, upon which our complicated structures are developed. And the watchful physician will ever look for what is of benefit to his race, though it may be in the operation of the lowest animated form.

Do not think that you cannot apply information thus gained to the case of the higher animals, and to ourselves. Bear in mind that the whole series of animals is a continuous chain, and that we are but the present top link. We know not what the future has in store. We have commenced where all commence, as a single cell, nay, even as a mass of protoplasm, and only differ in this, that we have passed through the typical stages of all below, till in our development we have overtopped the rest. The same chemical elements enter into the composition of the bodies of all, and the same general laws dominate over them. All must live on food that can be burnt, all respire oxygen to support the burning, all dismiss burnt products from their bodies. Nay more, all derive their powers from the same source, the glorious orb of day, the cause of every sign of animation on the globe. Well might the Aztec nation, so ruthlessly crushed out of existence by the Spaniards, in their fearful Mexican mines, adore the sun as the type of the deity, for on his beams, hangs all the life of the earth. Let our pride be tempered by the reflection, that our boasted powers depend on that distant fiery star, just as much as do the languid motions of the low-formed hydra; that both acknowledge alike his genial power when they move into the comforting warmth; and will come at last to believe in the relationship. Let it be true that we have approached more

nearly to the highest form that matter can assume under the laws of the Almighty, we are still but the sport of the agencies that surround us, as well as is the lowest plant. Our will would strivein vain against a few months obscuration of the sun; we should perish away with all the rest of animated nature. Let our earth recede farther in our winter season, from that luminary, as she has done in previous time, and as she will do again, when as astronomers express it, "the eccentricity of her orbit increases," and we shall vanish like a dream, our place being occupied by sheets of ice, and massive ever-gliding glaciers, as was the case hundreds of thousand of years ago. Let us thank Heaven that our life is of such microscopic duration, that so tremendous an event can be contemplated calmly, and that we can with selfish complacency, pity those who will be driven hither and thither to escape the torrid heat of summer, and the awful cold of winter, in those days of near approach and far recession from the sun.

And so again with equal mind, because our life is but a span, may we speculate on the eventual destiny of our swift-moving sun, and his attendant train of planets. We are whirling with fearful velocity through space; the earth around the sun; the sun around its centre in the distance Pleiades; and that with the whole group of visible stars, and far off Milky Way, most probably around some other still more distant centre of attraction. Revolution rules the universe. What if we should strike, not some attenuated comet, but fairly against another body of an equal size?

Of recent days such effects have been much studied, and from the collision of masses of small weight, aided by delicate means, such as the electric thermometer, the laws which rule both small and great have been found out. Astronomy, that queen among exact sciences, has lent her aid and pictured to our eyes on the grand scale, the results the mind had by its reasoning foreseen. Natural philosophy tells us that motion suddenly arrrested turns into heat. A little metallic mass dropped on a slab, from a few feet of distance, gives rise to a sensible warmth. A swiftly striking rifle ball may melt itself when it impinges on a hard surface. The minute aerolite, perhaps only a single grain in weight, coming at forty miles a second into our atmosphere, sets itself on fire by continued concussion against that tenuous body, melts, may even volatilize. So with the lordly meteor moving two score times as quickly as the ball just parting from the cannon's mouth, a long train of melted and volatilized matter is left in its track through the air. Some wish to have us believe that the light and heat of the sun, which is equal to the burning of millions of tons of coal every hour, has, as an origin, the perpetual concussion of multitudes of such small planets against his body.

If we therefore, or worse yet our sun, 800,000 miles in diameter, met in full career with its peer, then indeed should we be consumed away as with fire, in the twinkling of an eye, and the place where our system had been would appear to the view of the distant observer, as a blazing mass of vapor, extending beyond where the farthest planet had pursued its course, and ready to commence the slow cooling and contraction, marking the genesis of a new world, to be covered in future days, with its successive groups of upward progressing animals.

Is there not something in such reflections to elevate the soul, and make it feel in contemplating these workings of the divine plan, that the mortal clog cannot hide our connection with the great Architect. Made in his image, an inspiration of his breath, or as one half the human race believe, a part of Him we must be, to comprehend His stupendous ways.

And this leads me, before we part, to right myself in one thing, where a misapprehension may have arisen. I have insisted on the brotherhood of animals, the intimate relationship, the close connection. Why is it that such a doctrine is in some sort repugnant at the first sight? A something within us says, "am I only a hydra? are the words true which sing 'poor senseless worms are we?' is there no mark, no distinction? Can I not escape such a hateful fellowship?"

You may indeed, for your distance above in one most important and overruling particular, is so enormous, that it is only to the eye of the physiologist that the connection is visible. That nervous system, the instrument of the immortal force, which peers above and below, into the past and into the future, is in you a perfected instrument, while in these humble forms only its infinitesimal rudiment can be traced. As well might you attempt to produce the grand harmonies of the full chords of the organ from the ore of which its metal tubes are formed, as these to try to rival you in the manifestations of the mind. Well do the words of the Latin poet express our peculiarity and difference from them, "Mens agitat molem et magno se corpore miscet."

The tired hound may, in his evening dream, run through the stirring incidents of the day, the view halloo, the fierce chase, the many doublings, and the final death; the monkey may with wonderful address and absurd verisimilitude, mock the actions of his master; but where is that higher reason, that glow of the divine spark, which makes us like our Creator. Our bodies, weak vessels, are indeed alike, but when we have shaken off the frail tenement, who can tell what higher step in our development may next succeed, to put yet a greater gulf between us?