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AN INTRODUCTORY LECTURE DELIVERED
BEFORE THE MEDICAL CLASS OF HAR-
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Chemistry.

GENTLEMEN OF THE MEDICAL AND DENTAL
SCHOOLS:—

WITHIN the last few weeks many of the great cities of the civilized world have seen assembling within themselves many thousands of young men, drawn together by one common purpose, the same which brings you here to-day; some from the adjoining recitation room only; some back again after a period of quiet reading and resting in country homes, eager to renew old acquaintanceship and curious to study the faces of those who are to be your fellow students during the coming winter; some fresh from college or other preparatory school, it may be the field or workshop, to hear for the first time a lecture upon the profession you have chosen for the study and work of your lives. The pleasant task of first addressing you, of bidding you heartily welcome to these halls and to your teachers, has fallen to the lot of one of the youngest of them, who has not had time to forget his own first impressions of student life, its expectations and dissatisfactions; who hopes to be able still to speak to you simply as a fellow-student, only a little farther advanced along the path you are just entering.

I will not question the motives which have led you to choose medicine as your profession; it would be perhaps impossible for most of you so to analyze them as to give a reason for your choice satisfactory even to yourselves. During the sophomore and junior years there seems to spring up among undergraduates across the river a wide-spread passion to study medicine. It obtrudes itself in the form of half-dissected cats and their distorted skeletons, of un-

pleasant emanations and unexpected explosions within the Rumford rooms (or did in my day), in half-whispered accounts of visits to the operating theatre on Saturdays and entire silence with regard to the illustrations of syncope furnished the class while there. But these are exhibitions of a merely passing fancy, and the men who show the strongest manifestations of it seldom come here as students after graduating. It is not to be expected that you have chosen understandingly; you may have been drawn to it instinctively, or because a love of botany or partially developed taste for chemistry or zoölogy has guided you, but it is impossible that you should, even in a faint degree, comprehend all the difficulties and delights, the grandeur and the gravity of the study of medicine, until you are fully engaged in it, until it has completely possessed you. It is for this reason that counsel from those older than yourselves is valuable at this important period of your lives, that you may know in what spirit you are to begin, and after what method you should pursue, the study of this unknown object of your immediate future.

Fortunately we can go but a little way in the study of any of the branches of natural science, before that spontaneous and inevitable enthusiasm for the subject is developed, which attends the true student through life. Nature rewards those who thus love and woo her, with this spirit abundantly. It is the most prominent characteristic of all eminence in science; it permeates the whole existence of the real masters and teachers of our art, and radiates upon all who come within their influence a kindred glow and devotion. Recognize and cherish its first impulses in each other and yourselves therefore. It will strengthen by encouragement, it may be killed in the bud by a laugh or a sneer. It is the fashion in some places to deride it and its manifestations, if they seem a little above or outside the ordinary worldly or practical motives of action, and fashion is often mighty in such matters. It may crush out all the lofty and generous impulses in a generation, or

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in a community, or in a school of young men. But do you not be ashamed of enthusiasm. It has sometimes led men without a proper balance of intellect to do a foolish thing, but never an ignoble one. It is impossible to achieve real greatness in our art without it. Cultivate a spirit of enthusiasm for it therefore, and thus honor your manhood and the choice you have made.

But I need not tell you that something more than this is necessary, and more necessary in our profession than in the study of any other; that is hard and honest work. Work which, beginning with this hour for some of you, is to continue for you all as long as you claim the title of student or doctor of medicine. There can be no end, no interruption. You have come here to learn medicine, but in the three years nominally assigned to that object we can teach you almost nothing of its past history, but a part of what you should know of what is at present known, so much only as will enable you to go on with ourselves with the study of that of the future. You will learn that in those branches in which science is making the greatest advances the least is positively known, that the results of recent investigations in pathology, physiology and chemistry are as startling as was the discovery of the circulation in its day, and that each new revelation shows only more clearly how ill-founded is much of what we have hitherto treasured as fixed knowledge, and how much remains to be known.

You have entered, then, upon the study of a science always changing, to be ever new. Our posterity will never exhaust, never complete it. Your work, therefore, is of two kinds—to study the labors of other men in their relation to those of the past, and to learn to observe and investigate for yourselves. Now you will never advance far in either course without this work in its strictest and hardest sense. Call it “digging,” labor, or what you will, you cannot shirk it or avoid it in any way. It is before every one of you, whose humblest ambition it is to make himself a thorough, self-respected physician, in its naked and unpleasing reality, as your inevitable lot, as long as your mental and physical powers hold out. As long as the science of medicine progresses you must advance with it; the moment you drop the oars, you are far back in dead water.

This is not an inviting picture, I know, of your life to-morrow and every day to come. Work is not an easy thing, at least

to most men. It often means turning from the sweet and pleasant things of life, which are close at hand, to do much which is dry and difficult, apparently needless perhaps, for an object far off and doubtfully attainable. Such is the path, however, along which we must go, and happy are they who can follow it, surrounded by that golden atmosphere of enthusiasm, which makes one's footsteps swift and light.

But work can be made easier by cultivating habits of industry, by forming plans of study and disposition of time, the routine of which must be held inviolate. Custom makes everything endurable at last. Before this week has closed make your choice of studies, what lectures you will attend, what time you will pass in the dissecting-room and hospital, how you will spend the intervening hours, and how much of the evening you will give up to the requisite reading. These plans must vary for each of you of course, according to what you have already accomplished in your studies; but having wisely fixed them and in proportion to your strength, make it a matter of honor with yourselves not to deviate from them a single day to the end of the course. Let even February, when lectures become a burden to student and teacher, and when lengthening days foretell the relief at hand, find you constant to this pledge. If you succeed, you will have gained a victory which will well nigh of itself ensure your eminent success in after years, for the next trial will be easier to bear, and repetition of such training fixes the habit for life. Remember that there are no short cuts in medicine, that you are to take, what seems perhaps as utterly useless as it is uninteresting to you, at the value your teacher sets upon it, trusting him as the better guide to choose what you should be taught. With the confident expectation of the dawning of this spirit of enthusiasm, and with such self-promises of earnest and steadfast devotion to your purpose, I would have you to-day begin and continue your medical life.

But which of all the many branches taught here am I to select, and how shall they be best studied, are questions which will naturally arise in the minds of those just entering upon these duties. To those who have received no advice upon these matters, and have never attended a course of lectures, I would say, devote the largest part of your time to anatomy, physiology, and chemistry. These will teach you the structure of the human body and the phenomena of its functions, which constitute

healthy life. Many life-times have been spent in acquiring our present knowledge of them; you can well spend a year upon the same. Until you have done so, you cannot comprehend the later studies relating to the abnormal manifestations of the same vital actions we call pathology. Disease can never be properly recognized, interpreted, or treated, until the composition and function of every tissue and organ in the body are so intimately known that the nature and extent of any deviation from their normal laws are clearly understood. The autopsy room and lessons in pathology taught there are of no use to you, until you have familiarized yourselves with the dissecting-table and the histology learned in the microscope room. The bedside and the medical lecture-room are no places for you, until you have learned all that physiology will teach, and have made yourselves familiar with chemical reagents and their action upon the normal tissues and fluids of the body; you cannot understand therapeutics or venture to produce the physiological action of drugs, until you have studied their toxicological laws and relations of incompatibility. Two years are given to these studies in better schools than ours; so much you cannot give in our short and insufficient courses, but do not be tempted to give less than half as much. These branches are the groundwork of the art of medicine, and it is in these that students generally fail in thoroughness, and therefore as physicians fail to know their art through life.

You are to study them in the months which immediately succeed in several ways. Sitting through a lecture or a course of lectures is not necessarily study at all, and even faithful and comprehensive listening is but a small part of it. What you hear is to be received into your mind, not to be shut up within the covers of a note-book. It is to be digested while the impression is fresh upon the memory, and to be fixed there by the evening's collateral reading. A note-book is useful for such immediate assistance to the memory; if kept as a substitute for it, it is worse than useless. But in addition to the lecture and the faithful reading at night, your days should be largely given to the dissecting-room and the microscope, and to such chemical and physiological laboratory work as opportunity affords. A few dollars will give you all the apparatus you require to work out some of the most important investigations in these branches for yourselves, and to learn the processes of manipulation, which you will never acquire later, if you neglect them

now. By such beginnings you will gain the taste and courage for that independent work in later years which will distinguish you from the ordinary practitioner. I do not mean to say that you should take absolutely no share in any of the other exercises of the school, that you should not attend operations and occasionally visit the hospital, and see an autopsy, and perhaps study surgery and *materia medica*; but the less of these and the more of the others the better. A single year's attendance upon the advanced branches after such a preliminary training will give you a far deeper knowledge of them than one gets by a three years' course pursued without system or given wholly to the so-called practical or special branches.

There is no such contemptible spirit among students as this exclusive or preferred attention to such parts of their studies as seem to have a practical value. It exhibits itself in attendance upon the lectures relating to the practice of medicine or the hospital visit only, and in the production of the note-book only when the word treatment is mentioned or the formula of a recipe is given, and in the neglect of all that raises medicine to the rank of a science and its followers to be learned men. It degrades the art to the level of a mere trade. Such would be the spirit of one of a band of naturalists who, in regions unexplored by science, should spend his time in stuffing his pockets with grains of gold for future barter, while his companions were collecting the new and beautiful productions of nature's present work or the vestiges of the past lying about him, the possible and long-sought solutions of the grand mysteries of creation. I trust there is no one here who will entertain for a moment the unworthy thought of what is the money value of any information he may gain this winter. The truths we teach are worth knowing for their own sake, or they are not worth hearing. With us must rest the responsibility of the selection of what is best to teach. Have confidence enough in our judgment to receive as alike important whatever we offer.

There is another error with regard to choice of studies among students, of recent origin and of increasing importance. It has arisen from the modern custom of specialties in practice, and the desire on the student's part to devote his time wholly to those branches which seem to him most intimately connected with the particular specialty he may have thus prematurely elected for his future career. It is an error fatal

to your life both as student and practitioner, for it is impossible properly to study the diseases of any one organ of the body without that preliminary knowledge of pathology, which is only to be gained by a study of the whole. The most renowned teachers in special departments have been most thoroughly accomplished in others. What would ophthalmology, for instance, be today, had its special students not been eminent physiologists and physicists? Make no plans for your future life of practice of this kind, while you are students; the physician only can study a specialty. Fortunately it is a self-limited error, for the present fashion which leads almost every young medical man on going abroad to study a specialty, tempted by the easy success of many who led the van, will soon glut the real demand for such practitioners and convert general practice into the specialty, thus restoring the equilibrium.

I do not propose to discuss the subject of specialties, however; only to warn you, that you as students have nothing to do with it. What it has done for medical science in certain departments, you have opportunities of learning from the courses of University lectures, hitherto so-called, delivered in the school during the year. I am sorry to say that these opportunities have not been improved, as they should be. The Faculty has endeavored during the past few years to have presented to you by gentlemen outside their body and most eminently fitted for such duty, a summary of the most recent advances in these new and special fields of research. These courses have been prepared with great outlay of time and painstaking, and such labor has been wholly gratuitous on their part and for your benefit alone. They have furnished just such advanced knowledge, as many of you will go abroad to seek after graduating, and you have it offered you here by, I do not hesitate to say it, some of the very best students of the best masters. Let me advise you to show your appreciation of such teaching and of the personal efforts of these gentlemen in your behalf by a more universal attendance upon such courses.

There is one thing else I advise you to study during your whole pupilage, that is the German language; because the most of you have no doubt already more or less knowledge of the French, and secondly, because it is so much more important. Indispensable is the term I should use, for the science of modern medicine cannot be pursued without it. Why this is so, I shall

try to explain later, but the fact is to be accepted that nine-tenths of all that is new and important in physiology, pathology, and medical chemistry is the work of German hands and brains, and is given to the world in their tongue. Sooner or later the cream of this is translated into English no doubt, but before it is converted into this medium of circulation much of it is no longer new, and for workers in the same fields nearly valueless. If you desire to keep up with the progress of your art, you must learn German. It is far more essential to you as students than any knowledge of Greek, or Latin, and French you may have or have forgotten; it will be to you almost a sixth sense of acquisition. Begin the study of it at once. Those of you who purpose to continue your studies in Europe, will find yourselves thus enabled to enter upon them without a six months' loss of time after reaching your field of operations, and most of you may not find elsewhere the favorable opportunity of learning which a large city affords. You all could use it to your immediate advantage in the reading to be done in connection with the lectures in some departments.

Thus I have tried to show you in what spirit you should take up the work before you, how you should do it with your might, and in what order and method you should pursue the studies, and all the studies, prescribed for you. I have said that with us rests the whole responsibility of the choice of those studies and the character of the teaching. If you fail therefore after faithful improvement of the opportunities here offered to become physicians of the first order the fault is ours, and you and the community may call us to account. Is the standard of education in the medical department as high as in the others of the University of which we are a part, as in the other medical schools of the country, as in the schools of Europe, or as it should and can be? These are questions about which a very wide difference of opinion exists; and in which the profession, and you, as future members of it, have the same interest as ourselves. It would be difficult perhaps to determine whether the system of medical education, so long adhered to in American schools, is due to the views concerning its efficiency held by the profession generally, or whether it is the schools which are accountable for the tone which prevails in the profession at large with regard to the subject, because each creates the other; the schools fill up the ranks of the profession with their handiwork, and

the profession in turn furnishes the teachers and governments of the schools. But it is perfectly fair to judge the latter by their fruits, and a comparison of the character of the medical profession with that of the production of the other departments of the University warrants the conclusion that in its relations to the scientific aspects of medicine we cannot claim for ourselves our proper share in the credit which attaches to the other learned professions. That our cities are not known and honored in other lands as much for distinguished physicians as for their well-known men in literature and science, is our own fault alone, and the reason is that we do not sufficiently honor our own calling. We labor mainly to acquire position and comforts, but how few of us are really students and care more for the advancement of science than for our own "getting-on" in the world. How seldom has an American physician made independent and systematic investigations in any of the sciences connected with medicine! How different is a medical reputation in other countries! In Germany the celebrated physician first makes for himself a name by incessant toil and self-sacrifice. He cares neither for society, for appearances, for comfort, only for science, and then in after years come riches and honors, as well-deserved rewards. I would not have my meaning misinterpreted. I believe that those amongst us, who are so deservedly popular as practitioners, are in every way worthy of their success. It is the resting satisfied with success in practice and making this our only aim, which is so fatal to the progress of medicine with us..

This opinion is less deserved of some parts of our country than others; it has been too true I fear of all. I take my own share fully in any odium which may attach to any single member of the profession; but I believe that such will be the inevitable future of medicine in America, until change is wrought, where I consider the source of the trouble lies, viz., in our medical schools. So long as it is held that there is a demand for cheap doctors in this country, and that an American can get as good a medical education in three years without any necessary preliminary mental training, as a Prussian or Austrian youth thoroughly drilled to methods of work and habits of industry can get in six years, or one at any rate good enough, so long we shall make poorly educated doctors and nothing else; or we should do so, if students themselves did not know better and act accordingly in exceptional cases. A

student who spends one or more years in foreign schools, after being made a doctor here, cannot be pointed at as a specimen of American handiwork in answer to this view of the case. Do we ever reflect that the multitudes of American students in the medical schools of Vienna and Berlin are a reproach to our country? Why do we not find an equal number in the seats of Law and Theology, of natural and mechanical science there? The high and well-deserved reputation, which our students bear among foreign classes for quick perception and interest in their studies, shows the quality of the native material waiting the proper training at home; though I fear that our student abroad clings too closely to the spirit of his American education, and is found still following too exclusively the practical branches of his art. This is the evil genius of our system, its radical defect. It is here and within our schools that we must meet it. Until we renounce the theory that medicine in America is to be taught not as a science as elsewhere, that only so much of it is to be served up to the student as will make him a good practising doctor, and that he has no share in its future progress as an independent worker in its deep places, we need not hope for better things. Plans for elevating the standard of education by longer courses or forced attendance throughout the year, are of little importance, until we are prepared to make the spirit of our schools what it should be. Then every desired reform will follow without forcing.

How is it with the other departments of learning? Is there not the same demand for poorly educated men in the other professions as in medicine? Yet what would we say of the character of a law-school which should content itself with a plan of instruction adapted to make its students merely good practising attorneys, and not attempt to stir a higher ambition in them for the graver matters of statesmanship and international law; or what of a polytechnic that should turn out chemists and mining engineers with so little self-respect, so low a conception of the dignity of their calling as to sell their name to be attached to every nostrum in the market, or to furnish from an ounce of ore a certificate that a mountain of equal value awaits the investment of too credulous capitalists? Should we not demand a reformation in their management; would not a University to which they were attached enforce it? Fortunately this is not the character of these professional departments of Harvard; as high a

tone prevails throughout them as in any of the oldest and most renowned schools of Europe, and their graduates are recognized as the peers of their co-laborers all the world over. Can we say this of those whose education has been acquired solely in any of our schools of medicine? Is there any reason why we should not be able to say it, or at least should not want to say it? Has public opinion not a right to demand that medicine like all the other learned professions shall be of equal excellence with that of any country? For if there is any question of education in which the public should feel an interest, and act on it, it is that which determines the character of those to whom it must confide the care of its physical well-being.

To those who may say that I am taking an unpatriotic view of the matter, that my estimate of medical education and our profession in America is too low and unfounded in fact, I will only reply: when I find the young men of Europe flocking to our shores and crowding our native students from their seats and from the bedside, when the fees of our best lecturers are mostly paid in foreign coin, and when thousands of wealthy invalids from across the sea fill the waiting-rooms of our physicians, then I will confess that I am wrong, and that of the two systems of education ours is the best. Until then I shall seek in the spirit and working of their schools the secret of their success, the cause of our failings.

Turning a little way back into the past will perhaps bring out in still stronger lights the truth of the lesson we may read there. . . . There was a time when the French capital was looked upon by the medical profession throughout the world as the one and only seat of science, where alone the grand truths of our art could be discovered and taught. Students from every country went thither to complete their studies, and to see the men whose names had been upon the lips of their teachers all through their early instruction at home as demi-gods in science, and whose opinions they had been taught to receive unchallenged, as fixed principles. Even the hospitals associated with their teachings became famous, and Hôtel Dieu, La Pitié, La Charité, du Midi, San Louis, were as familiar and classic names to the student of medicine, as the Parthenon and Forum had been during school and college days. The distinguished men who composed the Faculty were then at the height of their fame, and formed a body whose brilliant reputation was fully deserved and

has never been equalled. Paris had then no rival as a school of medicine; she was the acknowledged front and centre of science. This was only a quarter of a century or less ago; but what position does she hold now? The earnest students of other countries no longer visit her exclusively, or even first or second, to complete their general studies, or to perfect themselves in any special branch of our art; nor is French now the universal or most important language of science, as it once was. The very names which then commanded such world-wide respect are now almost memories associated with the past, and are no more the representatives of the medicine of to-day.

What is the cause of this decadence? Why is it that the Wiener Schule holds at this moment the place then occupied by the Ecole de Médecine? The great masters in Paris have not died out and left their places to be filled by smaller men in Vienna, for with one or two exceptions the roll of French professors bears the same distinguished names that it did twenty-five years ago. Other causes have wrought the change. Gradually the philosophic German mind, so sceptical and irreverent as to accept no dogmas unchallenged, and so patient and industrious in following the suggestions of nature to their very source, began to make itself heard. This influence, at first felt in small things and expressed in special directions, soon became an acknowledged power, as the careful observations of devoted students, men who cared for little else in life than their studies, who had no higher ambition than their scientific reputation, who knew no other pleasure than was to be found in the laboratory or hospital, and who never aspired to become rich, became known. Such men as these were called together, as their names and works attracted attention, and formed the Vienna School, a body of special students, in no way men of brilliant genius, but keen observers and accomplished teachers. It is this devotion to study in special directions, as the prime object of their lives, science before wealth, that has made German medicine what it is. It has given us Rokitsansky, Virchow and Förster in pathology; Wunderlich, Oppolzer, Skoda and Frerichs in general medicine; Hyrtl in anatomy; Brücke and Ludwig in physiology; Jüger, Græfe, Donders and Arlt, Hebra, Sigmund and Scanzoni in their special departments; Liebig, Lehmann and Scherer in chemistry, and many other distinguished instructors who might be mentioned. In

the meanwhile Paris has been living chiefly on the reputation of her past greatness, and the slight progress she has made has seemed complete stagnation by the side of the vast advance of her indefatigable German neighbors.

This is a sketch I made only four years ago. See how closely the words then written resemble the language of Prof. Helmholtz, perhaps the purest scientist living, at the meeting of the German Association for the Advance of Science, at Innsbruck two years ago, in speaking of the secret of the success of science in Germany—the *Sittenstrenge und uneigennutzige Begeisterung* of its students. Words which Prof. Rolleston quotes in his recent address before the biological section of the British Association, and which, that they might be the guiding principle of all other students of science, he translates—"Severe simplicity of manners and absence of a spirit of self-seeking." What might not be said of the lesson brought down to these memorable days in the history of the two nations. How have splendor and self-glorification, worship of pleasure and shallowness of life gone down before earnest devotion to duty, trained habits of industry, and the highest and most universal education of the individual!

When I went to Vienna, fourteen years ago, I found but one American student there; but few had been there before me at long intervals, and hardly one, I believe, to remain any length of time. In contrast, a picture may be seen hanging in the office of many of our youngest physicians apparently of the recitation-room of our professor of clinical medicine during the summer session. The somewhat unstudent-like grouping will reveal to closer observation, however, that it is a Vienna photograph, but recently taken, in which that instructor is surrounded by the multitudes of our former students, who were continuing their studies there at that time. The change from then to now is not greater perhaps than what may follow a few years hence, when the graduates from our progressive collegiate department shall omit the intermediate step here, and begin, as well as end, their medical studies in foreign schools. Such must inevitably follow as the sequence of a more general acquaintance with the superior advantages offered by them, and with that requisite knowledge of the German language which enlarged freedom of election will afford, unless American schools shall make such a course unnecessary, by making themselves what those are and they should be.

This is to be a work, however, of slow and gradual progression. It cannot be enforced by any enactment of associations or change of statute alone. Their future success depends upon the teachers, and teachers, such as have made those schools what they are, must be created by our schools, and that is possible only by adopting the spirit and system which have led them up to their greatness. An ardent enthusiasm, earnest devotion to work, and a search for truth for truth's sake alone; and a system which recognizes a thorough scientific training as the only groundwork for a medical education, which teaches to the utmost limit the science of medicine in all its branches, and which believes, and proves, that the most practical man and best practising physician is he who has the widest and deepest knowledge of these scientific truths.

Follow with me the first clinical teacher in the world at the bedside. See how largely, in all he teaches, he draws upon the sciences connected with medicine, how thorough a knowledge of them he reveals, how constantly he applies it in the illustrations of his marvellous powers of diagnosis, how it makes him the renowned practitioner, as well as teacher, that he is. His knowledge of them is not picked up second hand, nor is it a patchwork of fragments selected with sole reference to its practical application. None more eager than he in attendance at the laboratories of his collaborators in chemistry and physiology, at the microscope, by the cadaver; none so constant through years, always searching, but as ready to follow as able to lead, knowing that there can be no halt in such labors and duties. Can we wonder at the success of a school where the most practical branches are thus taught? Yet there are those who hold and express honest convictions that such studies are not a part of a practising doctor's business, and that their patients are even the worse for it. In other words, that a man cannot make personal investigations in the sciences connected with medicine and do his whole duty by his patients. See how the vast advances in modern ophthalmology, which have elevated this branch of surgery to the rank of a true science, have been the result of the labors of a few such men as Donders, performed in the midst of the busy life of the popular practitioner. Do we not prize the professional advice of such as of the highest value, and seek it at any price? Scientific truths of the most important practical bearing in medicine must

in fact be mainly the result of the study, if not the prime discovery, of medical men, and I believe that no man can be a fit teacher to a medical school in any of the collateral branches of science, who has not received that special training which a medical education alone affords.

Who of us can say that he gives his whole time to his patients, that he takes no interest or active part in concerns outside the immediate care of patients, which might not, with the same devotion to them, be spent as well in the cultivation of scientific studies? Do not some of our best and busiest physicians find time and inclination for such side studies? May I not be allowed the liberty of naming one formerly and so long connected with this School, who though now retiring from an active part in the labors of his life, has been for so many years the acknowledged and revered head of our profession in New England, the physician to so large a portion of our most refined citizens, and the councilor sought above all by physicians far and near; is it believed that he was any the less skilled or attentive in his personal care of the sick, any the less sagacious in consultation, for the labors of his earlier life as explorer and writer in the unroamed fields of American botany, in whose path no gleaner has since been needed; or for those later studies in the arts and sciences, which made him so long conspicuous as the fit president of the most ancient and learned body of men of science and letters in the country? Would any of us change the memory which will attach to the name of Bigelow in American medicine? Would we rob our models of the ornaments which have given them this distinction? I fear we should thus degrade the greatest of them, if we are consistent with such teaching. Let us rather believe that great physicians have become great not in spite of, but in consequence of this cultivation of the sciences and liberal studies, which so characterize their lives.

Let me use the branch of medical instruction with which I am connected as an illustration of the relations of what is called science to medical education. There is no study which is considered less practical by the student, therefore there is none in which he takes so little interest, none in which he betrays such extreme ignorance in many cases at examination for degrees, as chemistry. How shall such a branch be taught? Chemistry has become of itself a circle of sciences, which no one man can now master, even by exclusive devotion to

its study. It is applied chemistry then alone which can be taught in a medical school, and the question is, how widely or how narrowly shall we interpret its application. Take, for instance, its relation to the study of one of the most important excretions of the body, the urine. Every student knows the importance of a chemical examination of this solution as a means indispensable in the diagnosis of certain diseases, and that it is necessary to be able to recognize the presence or absence of certain substances in it by simple tests. But is it enough for him to know, or for us to teach, the crystalline form and chemical reaction alone of uric acid and urea, for instance, and the semeiology of their fluctuations? Is he not rather to be led also to comprehend how intimately the study of these bodies is connected with that of the metamorphosis of our tissues and the dynamic value of the intermediate products of tissue change; how from the former an almost endless series of new compounds may be created, some of which are important way-stations between health and disease, and which can only be understood through the formulæ which express so much while seemingly so meaningless? How the latter, the last expression of a long series of intermediate chemical changes, passes out into the world again reduced to the simplest form of matter, ammonia and carbonic acid, to form in turn the life of the vegetable upon which the animal directly depends for support. How the quantity of urea is the index in part of the amount of heat and motion manifested by our tissues; how its spontaneous change into ammonia and carbonic acid leads to the lesson to be learned by the study of its artificial production in turn form cyanate of ammonia, which was the first blow to the theory of vital action as a necessity in the conversion of inorganic into organic matter.

These are but a few only of the questions of prime importance suggested by the mention of these well-known ingredients of this excretion, but they form but a small page in its chemistry as a whole in relation to medicine, and this but a chapter in the grand volume of physiological chemistry. Even the little deviations from its ordinary operations, which we know as pathological chemistry, can never be fully understood without a thorough knowledge of its normal laws in their widest application.

But it is not only in its relation to disease that the study of chemistry is of interest to the student. Recent inquiries,

directed by a few master minds, into the laws and phenomena of nature, have shown that a marvellous correlation exists not only between her creations, both animate and inanimate, but between forces hitherto considered distinct, bringing so-called physical laws into close connection or identity with those we call chemical, and throwing grave doubts upon the existence of any such distinct power as that called vital force. The study of animal chemistry has therefore come to occupy a position of great importance and interest in this connection, for it is through its aid that we can trace the mutual relationship existing between the phenomena of our vital existence and outside physical forces and their products, between our tissues and those manifestations of our higher and inner nature we call mind or intellect. These questions have excited the active interest of the highest intellects of our time. Their consideration has been impatiently snatched from the field of scientific observation, and made the subject of passionate discussion in public arena. Such opinions as the following could indeed hardly pass unchallenged.

Prof. Owen expresses his conviction that "vital forces are only ordinary physical forces, that inanimate matter is made into living beings by conversion of chemical into so-called vital action."

Odling says, "But what the physiologist means by vital force I have never been able to understand. So far as I can make out, it seems to be a sort of internal, intransferable, immeasurable, self-originating power, which performs nutritive acts by its absolute will and pleasure, as if it were not abundantly manifest that the growth of a plant and incubation of an egg cannot be performed without a direct supply of external force. * * * Seeing then that the enormous number and variety of animal and vegetable compounds are produced out of carbonic acid, water and ammonia, not by any peculiar vital force, but merely by the light and heat force of the sun acting through organic machinery, the question naturally arises, whether the chemist may not effect in his laboratory-machinery a similar intercombination of deoxidized carbonic acid and water, either by a direct application of sun-force, or indirectly by the aid of those terrestrial transformations of sun-force, which are so abundantly at his disposal. This question, decided absolutely in the negative so long as the fiction of vital force tyrannized over men's minds, has of late years received a rapid succes-

sion of brilliant affirmative replies. Already hundreds of vegetable compounds, heretofore produced only in living organisms, and, as was supposed, put together and held together by vital force, have been formed by the chemist in his laboratory. * * We see no reason to question the chemist's ultimate ability to reproduce all animal and vegetable principles whatsoever."

There are those, however, who do not stop here, content with thus referring our merely animal functions to the general chemical and physical laws which govern all matter, laws which make no distinction in their control over the growing crystal and the human foetus, but would apply the same explanation to those intangible manifestations of consciousness, will, and intellectual power, which we have so long looked upon as within us and not of us, far removed from any connection with material phenomena, and which we call mind. The theory is a fair one, and we should not be scared from its contemplation now or its acceptance hereafter, if properly substantiated, by any cry of materialism or heresy it has stirred up. The same outcry has been resounding in ever narrowing circles from long before the days of Copernicus and Galileo. If it had been heeded our knowledge of geology would still be confined within the scriptural statement, and our acquaintance with man's previous existence on the earth limited by the records of a restricted archaeology. It has been the never failing opponent of all progress in natural science, but its influence has perhaps been more beneficial than otherwise, as it has served as a healthy stimulus to observers. We should never let it deter us therefore in our investigations of the laws of nature, or hesitate to accept the path their proper interpretation points for us, over whatever dogma it may lead. A search for truth in an honest spirit of inquiry will never lead us to wrong, as we follow only where the Creator has been before.

Thus we shall be prepared to receive in the spirit in which they are written these words of Prof. Huxley in his lay address on Protoplasm or the physical basis of life. "In physiological language all the multifarious and complicated activities of man are comprehensible under three categories. * * * Even those manifestations of intellect, of feeling, and of will, which we rightly name the higher faculties, are not excluded from this classification, inasmuch as to every one but the subject of them, they are known only as transitory changes in the

relative positions of parts of the body. * *
 * Carbon, hydrogen, oxygen, and nitrogen are all lifeless bodies. Of these carbon and oxygen unite in certain proportions and under certain conditions, to give rise to carbonic acid; hydrogen and oxygen produce water; nitrogen and hydrogen give rise to ammonia. These new compounds, like the elementary bodies of which they are composed, are lifeless. But when they are brought together under certain conditions they give rise to the still more complex body, protoplasm, and this protoplasm exhibits the phenomena of life. I see no break in the series of steps in molecular complication. * * * If the properties of water may be properly said to result from the nature and disposition of its component molecules, I can find no intelligible ground for refusing to say that the properties of protoplasm result from the nature and disposition of its molecules. But I bid you beware that, in accepting these conclusions, you are placing your feet on the first rung of a ladder which, in most people's estimation, is the reverse of Jacob's, and leads to the Antipodes of heaven. It may seem a small thing to admit that the dull vital actions of a fungus, or a foraminifer, are the properties of their protoplasm, and are the direct results of the nature of the matter of which they are composed. But if, as I have endeavored to prove to you, their protoplasm is identical with, and most readily converted into, that of any animal, I can discover no logical halting-place between the admission that such is the case, and the further concession that all vital action may, with equal propriety, be said to be the result of the molecular forces of the protoplasm which displays it. And if so, it must be true, in the same sense and to the same extent, that the thoughts to which I am now giving utterance, and your thoughts regarding them, are the expression of molecular changes in that matter of life which is the source of our other vital phenomena. * * * Every word uttered by a speaker costs him some physical loss; and in the strictest sense he burns that others may have light. So much eloquence, so much of his body resolved into carbonic acid, water, and urea. * * * Two things are certain: the one that I hold these statements to be substantially true; the other that I, individually, am no materialist, but on the contrary believe materialism to involve grave philosophical error."

I have thus quoted from some of the most daring and yet soundest thinkers and keenest observers, to show the tendency of

modern belief in these directions, and to illustrate how intimately the study of animal chemistry is connected with some of the most profound problems of life. In fact, the conclusions they advance are founded in detail almost wholly upon the observations of the latest German workers in physiological chemistry, and none but those prepared by study to judge the accuracy of the latter, are competent to decide how far the deductions of the former are justified. They are questions, however, about which all the intellectual world is talking, and too large a portion of it writing. Protoplasm has succeeded Darwinism, and later the Correlation of Forces, as the pet theme, and a great deal of nonsense is said and written about it. The thought of vast beds of homogeneous *Urschleim*, the matrix of sub-embryonic life, the unshaped beginning of the fauna and flora of future epochs, lying beneath the silent and solemn depths of ocean, is indeed calculated to startle the reason of men of science from its accustomed channels, and excite the interest of the least thoughtful. You will find yourselves often called upon, no doubt, as professional men and students, to explain or offer an opinion upon this or that statement in the controversies which have arisen and are to follow, but you will be able to make but a poor response, unless you have made yourselves familiar with the details of the data upon which the whole question is based, and which concern you so deeply in other relations.

I would have chemistry taught, then, in its widest application possibly consistent with the student's period of study; in its fullest bearing upon and as the most important means in the study of physiology; in its relation to materia medica, the incompatibility and physiological action of drugs; as the basis of toxicology, and its important services to medical jurisprudence; and, finally, for the superior and exact mental training it affords to a profession sadly needing it, and for its irresistible guidance of the student into the ever-widening paths of general science and a broader culture. I would have the student taught all this, not as if it were to be the end of its study, but as the beginning of independent work on his own part in one or the other of these directions, so that his life may have given something to science in return for the much he has received from the labor of others.

And such is the spirit I would see carried into all your studies. I would have you dispossess your minds of the too com-

mon belief that everything can be learned at the bedside; it is a fatal barrier to individual and national progress in medicine. Nothing can be gained there but the shallowest, routine acquirements, until the senses have been taught how to investigate, and the mind prepared, by long and diligent study of the normal laws of life, to comprehend the phenomena of disease there presented. Even when thus trained, you will find that much of the first importance cannot be gained by bedside studies. Man has been looking at his sick brother now for centuries; he has learned the interpretation of many symptoms, and the pathological changes of structure and disorders of function thus indicated, but what has he learned there of their causes, and how little of means to cure! Medicine has accomplished but little yet of its possibilities for the benefit of mankind. I may venture the prophecy that its grandest discoveries are waiting outside the sick room; that in his surroundings, the air he breathes and its unseen inhabitants, the foreign elements which make his food and drink, the soil upon which he dwells, lie hid the obscure causes of pestilence and contagion. They will not reveal themselves by watching their effects, nor will they cease to do their accustomed evil in the world, while the present narrow system of exclusive clinical investigation is adhered to. There is of course nothing new in this prediction; we are all familiar with such views, and all believe there may be something in them, as we say, and there stop. But where do we see put in operation in any systematic and large way, and by competent observers, those investigations which would sooner or later test their truth? Where are our students taught, as they should be, the laws of hygiene, and made acquainted with the lowest forms of organized existence, without which knowledge their explorations may result in such pretentious exhibitions as have lately been forced upon public attention to the discouragement of future intelligent observation in the same field!

I cannot refrain from quoting from Prof. Huxley's address before the British Association for the Advancement of Science at Liverpool a few weeks ago, on the germ theory of life. "I commenced this address," he says, "by asking you to follow me in an attempt to trace the path which has been followed by a scientific idea, in its long and slow progress from the position of a probable hypothesis to that of an established law of nature. Our survey has not taken us into very attractive regions; it has lain

chiefly in a land flowing with the abominable, and peopled with mere grubs and mouldiness, and it may be imagined with what smiles and shrugs, practical and serious contemporaries of Redi and Spallanzani may have commented on the waste of their high abilities in toiling at the solution of problems which, though curious enough in themselves, could be of no conceivable utility to mankind. Nevertheless you will have observed that before we had travelled very far upon our road there appeared, on the right hand and on the left, fields laden with a harvest of golden grain, immediately convertible into those things which the most sordidly practical of men will admit to have value, viz., money and life. * * * * Looking back no further than ten years, it is possible to select three in which the total number of deaths from scarlet fever alone amounted to ninety thousand. That is the return of killed, the maimed and disabled being left out of sight. Why, it is to be hoped that the list of killed in the present bloodiest of all wars will not amount to more than this! But the facts which I have placed before you must leave the least sanguine without a doubt that the nature and the causes of this scourge will, one day, be as well understood as those of the Pebrine* are now; and that the long suffered massacre of our innocents will come to an end. And thus mankind will have one more admonition that 'the people perish for lack of knowledge,' and that the alleviation of the miseries, and the promotion of the welfare, of men must be sought, by those who will not lose their pains, in that diligent, patient, loving study of all the multitudinous aspects of nature, the results of which constitute exact knowledge, or science."

But what can be done to correct the failings of medical education in America, to elevate its tone, to stimulate the cultivation and teaching of science, to place our schools on an equality with those of Europe, with other departments of learning at home? In the absence of any general central power such a change can be effected, I believe, by no concerted or enforced action on the part of the schools, for they are too numerous and are governed by too diverse and independent motives of interest to unite in any practical scheme of reform. Each must act for itself, and stand or fall as its policy proves to be wisest or not in the end. We are responsible therefore only for ourselves, and the question reduces itself to the relation of Harvard University to medical edu-

* Vine disease.

cation, to the duties of you its students, of us its representatives in the medical department. Your own obligations to the future of the profession, to the school, and to yourselves, I have tried to place before you in what I have said; but how can we, who are answerable for its more immediate success, respond to that new vitality which, radiating from the collegiate centre shall freshen all the other departments to unwonted activity? How can we contribute our share to the common purpose of making our alma mater in all her schools the head of education in America, a true University of the first class?

First, we might insist that students should come better prepared by previous intellectual training and by the study of such preliminary branches as general chemistry, physics, botany, and the Latin, French, and German languages, to comprehend at once the higher lessons of applied science. Secondly, that they should remain connected with the school throughout their whole period of study; that the lectures should not be crowded into four months' space of over-work, but blend with the present summer course of instruction in a harmonious and far more useful scheme; that the students should be divided into classes by years, and be required to follow the gradation of studies adapted to such classification; and that the whole time of study be prolonged one or two years, as in foreign schools. Thirdly, that no student should receive a degree in medicine, until he has passed a satisfactory examination in every branch that is taught in the school.

Such are the measures which in time would raise an American Medical School to an equality with the best elsewhere; they can be, and, I trust, will eventually all be carried out; but what would be the immediate result, if the government of the University should ordain such a revolution in the American system? An analysis of the list of those who attended lectures last year shows that of 276 students but 62 had received a previous collegiate education, so that probably not more than a quarter of the whole could have met the required terms of admission; next, that but 92 of the whole number were connected with the summer school during any part of their whole course of study, and this represents fairly enough the proportion of those whose circumstances would permit a constant connection with the school, even for a three years course; were it prolonged, even this estimate might be too high. We

may conclude then that such a reform would inevitably be followed by the immediate loss of two thirds of its present number of students, by an equivalent crippling of its material resources, and the sacrifice of the prestige of a large school. It is evident therefore that without other means of support than those now at command the school could not be carried on.

But if on the other hand such means were provided, what would be gained to counter-balance that which would be lost by such a reformation? In the first place we should be able to systematize our instruction, now wholly impossible when individuals may begin their studies at all times; for when the third year student and the beginner without the slightest preliminary knowledge of chemistry, for instance, are to be found in the same recitation-room, it is evident that such instruction must be far above the understanding of the one or as far below the requirements of the other. We should equalize the value of our degrees, which are now most unfair in their significance, while no distinction is made between the student who only sits more or less of four months in our lecture-rooms and those who have been under our personal guidance for three entire years. Now Harvard University puts the same stamp of approval and warranty on both. And we should enhance the value of our degree a hundred fold. As it became known that this school had ceased to compete with others in a system so well adapted to make the most rather than the best physicians, that it required a certain preliminary training before it received students, and kept them long enough to educate them thoroughly before it let them go, and that its degree meant something quite apart from that of other schools, this certificate from the oldest university in the country would be sought by the best class of students from all its parts, as is that of its other departments, and its graduates would at once assume a distinctive position in the profession. This would force the best existing schools in turn up to a higher level, and thus the character of medical education would be gradually rescued from its present deplorable condition. Such, I believe, would be the happy results of such a reform. Such a reform, too, would best come from a school which was the first to establish the summer session, and has inaugurated within a few years other changes in the system of medical instruction, by which it has not only greatly improved itself, but the schools of other cities also which have followed its lead.

But if we cannot with our present means immediately effect so great a change, we can at least and at once take some of the steps above alluded to. If we cannot make it obligatory, we can make the summer course so instructive that students will be drawn to spend the whole year in the school. We can encourage a love of science and the habit of independent investigation among them. We can insist that the student shall pass a satisfactory examination in every department, before he can obtain a degree. If these branches, each and all, are considered an essential part of medical education, of course no person is fitted for practice, until he has acquired the slight knowledge of them necessary to pass the examination at any of our schools. Yet the university now publishes, with other inducements to the student, the offer that he need prepare himself in but five out of the nine departments taught. How, with so wide an opening for escape kept standing before his eyes, can we expect him to know anything of the branches not directly connected with practice. Finally, we can encourage the beginning of any movement tending to the consummation of any or all of these changes.

The last public ceremonial in the Annals of the University before this of to-day was the laying of the corner-stone of a memorial in commemoration of her sons who met heroic death in discharge of man's noblest duty. It is a monument to the dead, but for the living. While it rises, and as long as it continues to stand, it should be to all, student, teacher, graduate, the same memento; that the spirit which led them in the hour of their country's peril to offer their lives to her, should be none the less ours in the safe and easier future they have left us; a spirit of devotion, of self-sacrifice if need be, to the highest duties, towards the noblest ends—not reserved for public and exceptional display, but to be the ever constant motive in the doings of daily life. To show how we may best discharge our present obligations to humanity and to the cause of medical education in America, has been the motive of this address.

ADVANTAGES OF FOREIGN STUDY TO AMERICAN MEDICAL GRADUATES.

By EDWARD WIGGLESWORTH, M.D., Boston.

"HOME-KEEPING youth have ever homely wits," and we trust that, among medical students at least, no one can be found igno-

rant of the advantages to be derived from a more extended experience. To show the necessity of improving these advantages, in what they consist, where they may best be sought and how, is the object of these few words addressed to American medical students about to graduate.

We all appreciate thoroughly the enlarged, cosmopolitan and eclectic views of our revered professors, who "prove all things and retain the best," but *exemplo plus quam ratione vivimus*, and however good our theories may be, we need actual experience also to fit us for our career. *Experientia docet*, and we should compare the experiences of many men and under varied conditions. We should study disease under different climatic influences, under the influence of different temperaments and of different habits of life. We should compare the maladies of widely separated lands, and endeavor to ascertain the causes of their dissimilarity. Are we to be general practitioners? Consider the responsibility of taking into our keeping the life of a fellow human being and the happiness of his friends. It is not enough to feel that we have done all that we could for his benefit; we should wish to feel that we have done all that any one could. Are we to be specialists? Science, thanks to the mechanical discoveries of the last few decades, has now progressed so far that it is impossible for any one man to master thoroughly all branches of medicine, and we should wish, after, it being distinctly understood, a thorough general course, to study our specialty in that place where, from any reason, this specialty has been most completely investigated. And bear in mind that the specialist must never neglect general extension of knowledge while devoting himself to intensifying his acquaintance with a particular branch. His rule of conduct is addition, not substitution.

In what do the advantages of foreign study consist? Generally, in the age and experience of Great Britain, the systematic method and accurate analytical investigation of Germany, and the bold experiments of France. Particularly, in the fact that whereas republics are slowly and unwillingly forced into establishing imperfect institutions by voluntary contributions, despotism compels at once the perfect formation on a grand scale of that which is seen to be needful. In La Charité at Berlin and Allgemeines Krankenhaus at Vienna may be found under one roof every department of medicine, and the entire quarters in the neighborhood of these grand hospitals are