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Jackson (S)
LECTURE,

INTRODUCTORY TO A COURSE

ON THE

INSTITUTES OF MEDICINE,

IN THE

University of Pennsylvania,

DELIVERED OCTOBER 20th, 1847,

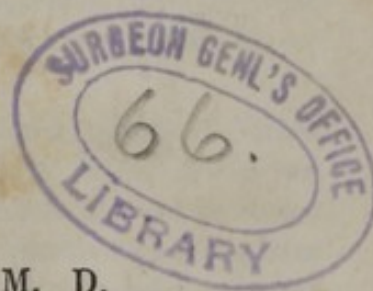
BY

SAMUEL JACKSON, M. D.

Philadelphia:

PRINTED BY JOHN YOUNG, BLACK HORSE ALLEY.

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1847.



LEU URB

INTRODUCTION TO A COURSE

SYSTEMS OF MATHS



SAMUEL JOHNSON

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Philadelphia, October 30th, 1847.

DEAR SIR :

At a meeting held on the 26th instant, by the Medical Class of the University, it was

"*Resolved*—A Committee, consisting of one from each State, be appointed to wait on Dr. Jackson, and request a copy of his able and eloquent Introductory Address for publication."

Allow us, Sir, on part of the Committee, to add our solicitations and express a hope that you will comply with our request.

Yours, very respectfully,

LOUIS FASSITT.

WM. P. SEYMOUR.

JAMES F. CLAYTON.

Philadelphia, October 30th, 1847.

GENTLEMEN :

It is with pleasure I comply with the request of the Medical Class of the University, communicated to me in your note of this date.

I embrace the present occasion to express the gratification I have felt, that, contrary to the predictions made, so large a body of Medical Students as compose the present class have responded promptly to the wishes of the Medical profession, announced in the proceedings of the late Medical Convention; that they have entered into its views, and adopted its plans of Medical Reform, which they are carrying out as far as comes within their province.

The spirit that prevails in the class is cheering, and betokens well for the future. The Medical instruction of our country must be rescued from the imputations cast on it, the Medical Diploma be restored to its just value, and the Medical Profession be raised to its proper dignity and importance, when the students themselves, from a generous ambition, and patriotic feeling, are the prompters to more extensive courses, to a superior order of education and higher requisites for graduation.

Accept, gentlemen, the assurances of my esteem and respect, and believe me,

Truly, yours,

SAMUEL JACKSON.

To Messrs. Louis Fassitt, William
P. Seymour, James F. Clayton,
Committee, &c.

1844-1845

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On a visit to the ...

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LECTURE.

THE political and social institutions of our country, are an unfinished experiment. It involves the future destinies of mankind. It is full of deepest interest, not to our people alone, but to those of the whole human family. It is impossible at this time to predict what will be the final products of the numerous mingled elements, exerting their mutually conflicting reactions in the political and social alembic of this nation.—We fervently hope, and in that hope feel a devout faith, that under the working of Divine Providence, the experiment will be successful, answering the high expectations it has excited in the bosoms of patriots and philanthropists, at home and abroad.

The problem to be solved by the experiment of this country is, whether a purely popular government like ours, is capable of a social organization securing the progress of civilization in the masses, the advancement and diffusion of science and knowledge, the cultivation of letters, arts and religion, the development of the moral, intellectual and spiritual nature of man, and the final ascendancy of this last over the animal instincts and passions of his brute nature. Or, must the attainment of this advanced, but possible state of human society, be worked out by the greater wisdom and foresight of a governing class, independent of the people, and who have in charge the providing for, and the regulating of, all the social and political interests of the people.

The two systems at this time stand fairly front to front, are in full action, and on experimental trial.—

In the United States, the people are the sole sovereign. They have entire possession of the governing power, both for political and social objects—Popular government never before had the same opportunity of having its capacity for good or ill so fairly tested.

In Europe the governments,—monarchies and aristocracies—are clothed with power of varying absoluteness. The people are deprived of all participation in them, or, at the most, have a very partial representation.

It is the duty of every American citizen who would desire to give to our system a fair trial, and to perpetuate the political institutions of his country, that he endeavour to render them the most effective that is possible for the ends that every sound government ought to attain—the promotion of the material welfare of society, and the elevation of the masses in the intellectual and moral scale of being.

The European monarchical governments, those of the Continent espe-

cially, have all issued from the legalized atrocity of the Feudal system—The people robbed, plundered, deprived of all right to the soil fertilized by their sweat and blood, reduced to serfs, and subjected to every mode of oppression, by a fierce and ruthless chivalry, sunk finally into a state of ignorance bordering on brutality. In this debasement they were unfitted for the exercise of political power, and scarcely capable of social rights.

The spirit that governs the legislation and policy of Europe, though meliorated by the influence of the Christian religion, and softened by the cultivation of letters, arts and science, have yet the taint of their origin. The masses are not an integral part of the government—They sustain it by the fruits of their industry, by their courage and by their blood, but they have no participation in its legislation, in its privileges, its emoluments, or its honours. They are deemed incapable of regulating the most common of their social measures, or providing for the most ordinary wants of society. Every social regulation emanates from, and is in charge of government; nothing is entrusted to the people. They are kept in perpetual wardship and pupillage—governed, not for themselves or by themselves, but for others and by others. It is made a plea for the deprivation of every legislative function, that the people would, from ignorance, want of prudence and forecast, damage themselves and and prove their own worst enemies.

As a part of this system, medical science in Europe is under the supervision of government, and the medical profession is regulated by medical codes, more or less elaborate. The provisions of these codes, it cannot be denied, are not without benefits to society. They protect it against the evils incident to irregular and empirical practice; and a body of well instructed medical practitioners, adapted to the wants of the community are provided, skilled in every department for the treatment of the various maladies and necessities that render medical services essential to human welfare: ample provision is also made for the cultivation of the science and to aid its progressive advancement.

It is not objected to the European medical legislation, that it is defective, or without positive value, or unnecessary. In their circumstances and with their system of government, it is indispensable. But we contend, that all its advantages may be attained under our free institutions, and without the interference of government legislation.

A people perfectly free, accustomed to rely on themselves for self-protection in the affairs of life, have their intelligence awakened and invigorated, and their wits sharpened to a quick sense of their self-interest. Let them be instructed in the truth, and understand what is the best for

their interest, and they decide correctly. The first duty of a free people is to make full and adequate provision for carrying, not merely common education to every domicil, but to diffuse throughout the community, by popular instruction, correct scientific principles. It is the limited information, I may go further and say, the almost entire ignorance that pervades all classes, the highest as well as the lowest, of the general principles of science, that is the bane of society—it is the pregnant source of most of the social ills, and leaves the community to be deceived and preyed on by humbugs, charlatans and quacks of every kind, political, financial, religious, and others, more numerous even than those that swarm in the medical domain.

In our popular system the medical profession ought to have under its supervision and regulation the medical interests of society. No others can understand them as well, and consequently manage them in a manner to obtain the greatest advantages they can yield. The medical community is to the medical interests of society, what the religious community is to the religion of the community. This is maintained in a sound condition by the organization of the various religious sects that compose the Christian church.

But let us inquire what are the interests that society possesses in medicine. They are

1st. That it may be perfected as early as possible, as a science of facts, and cease to be one of words. This reform is now in active progress.

2d. That medical instruction should be confided to schools properly organized and correctly conducted; that it should be formed on a system of full, complete, demonstrative and practical courses, ensuring to the community a body of highly educated, skilful and well disciplined physicians.

3d. That those physicians properly qualified by their education, and recognized as such by the profession, should be made known and distinguished from the host of pretenders, impostors and empirics, who assume the title and make pretensions to the character of physicians.

This can be accomplished by a system of registration for each state and county. The register should contain the names of those who have gone through regular courses of instruction, are established in practice, and have been recognized as belonging to the profession, whether graduates or not. If graduates, the school conferring the diploma should be named. The register should be published at stated periods.

4th. That those physicians who, by notorious irregularities and dishonesties, by moral delinquencies, have forfeited their privileges and

standing, and lost the confidence and respect of the profession and the community, should be struck from the register. Being thus disowned by the profession, it purifies and vindicates itself from the responsibility of their misdeeds, and places the public on its guard against the transgressor.

Measures of this kind to be carried out, require that the medical profession throughout the country be organized; that it should be embodied and be endowed with corporate faculties, fitting it for action. A commencement has been made: it should be persisted in. The profession should rally round and sustain the present National Medical Association. Its constitution is imperfect, but this can readily be amended. The political organization of our government, and that of our religious societies, I would suggest, are the best models from which that of the profession can be moulded. The profession in each state should be formed into county or district medical societies; and a state medical convention, composed of delegates from the local societies, might hold annual or biennial sessions. The medical interests of the state would then be under the supervision and direction of these bodies. A national medical convention or senate, composed of representatives from the local societies or the state conventions, with triennial sessions, might have in charge the general affairs of the profession extending over the union.

Public opinion in this country is a power possessing the authority of law. No law can well be enforced that is opposed to public opinion. What is law but public opinion clothed with form? Public opinion enlightened by correct knowledge is the best legislation.

The masses of mankind seek for truth, love the right, mean well. Their errors are from ignorance. They are imposed on by cunning impostors, by empirics, by the dishonest of every grade and kind, and by shallow pretenders. They are confiding from a sense of their own honesty, and are deluded by plausible assertions, by falsities, by partial and deceptive statements, the truth of which they have not the requisite knowledge to determine, and are compelled to take on trust.

The organization of the medical profession and its representation in state and national associations, while it will build up a medical public opinion, that the profession will feel itself bound to look to and be governed by, will also give a direction to the general public opinion, that will do more to discountenance ridiculous doctrines, to repress empiricism, and to destroy quackery, than could be effected by the most stringent laws.

On every thing connected with medicine, the public are lamentably ignorant. Few, indeed, have the slightest idea of the true character of

medicine as a science. The opinions generally entertained, even by the best educated, are vulgar errors. Can we be surprised, then, at the prevalence of empiricism, of the rapid succession of fantastic systems and modes of treatment, acquiring a fashionable vogue, or of the spreading abroad of the lowest quackery.

The only method to combat these errors, and effectually to guard the community against their mischievous consequences, is to diffuse correct physiological and medical doctrines amongst the people—Give them light and they will not walk in darkness. The Medical Profession must do this—medicine has no more mysteries than belong to any other science. As medicine rises into a science, it becomes a matter of plain common sense. Mystery and concealment are cloaks to hide ignorance, while wonder-working pretensions, are the duping of the credulous ignorant by knavish impostors.

The public on the subject of medicine intend well. Men would not knowingly jeopard their health and life by a dangerous practice—When quackery is preferred, it is from a belief that it offers more certainty and safety than regular practice. Too much is expected from medicine ; and physicians are probably to blame for much of the false opinion that prevails on the curability of diseases and the curative power of remedies. Exaggerated and false notions regarding them are the main-springs of empiricism and quackery. A belief in specific cures, and the provision by Providence of an especial remedy for all diseases and for every symptom of disease, are almost universal. Hence it is, that the false statements, and certificates, and delusive promises, constantly spread before the public, find a ready credence. They chime in with the popular belief. It is this that gives permanency to quackery, though there is no one quackery but what is short lived. An empirical pretender, or nostrum, or false doctrine is run after and adopted for a time by crowds of the weak and credulous, but the fallacious promises held out are soon belied by experience, and neglect and oblivion follow. But another and another succeeds to meet the same fate, and this course continues and will be perpetuated, until the public mind is enlightened on the true character of medical science, and understands the limits within which it is restricted.

Man cannot change the ordinances of God ; and He has established a law of death, as fixed as the laws that regulate the return of the seasons and the revolutions of our globe. Of 100,000 born of the human race on any one day, a given number, it is known, will die in any given period, from a day up to the latest period of life. The numbers that will have died in any year, and the number that survive, can be calcu-

lated to a fraction. Medicine cannot defeat this law. Diseases themselves furthermore have their law, regulating the rates of their mortality, so that in a specified number of cases, the number of deaths and recoveries can be counted on with great precision. The well-instructed physician knows often from the commencement of a case that it is hopeless,—that his task is to procrastinate, to assuage, to alleviate. The influence of medicine is limited to individuals ; it cannot be felt in changing the law of mortality in the masses.

The greatest benefits that medical science can render to society, are probably to be found in the hygienic measures, individual and public, which it prompts to, for the prevention of diseases, by ascertaining the causes of insalubrity, the circumstances that provoke attacks of disease, and the means of removing or abating them. In our country the value of medicine in this respect is rarely thought of. In England it is now attracting attention, and the Government are engaged in the enactment of a series of sanitary regulations, that promise a marked diminution in the rate of mortality, and an increase in the expectation of life in the labouring classes, in which it is the lowest.

That public opinion in respect to medicine and medical practitioners, is in the main sound, is shown in the number of medical students that frequent the medical schools each year. What gentlemen has induced you to enter upon the severe labor of a course of studies in the schools of this city? The life of a medical student who would merit his diploma and wish to make sure of his success as a practitioner, is not one of ease, of pleasure, or of comfort. He must task all his powers, intellectual and physical. He cannot relax in his exertions without falling behind, so rapid is the speed with which science now moves on. It is much easier to win spurs in the barbarian contests of war, than to gain triumphs in the more glorious fields of science and of art.

No law imposes on you the obligation to undergo this toil, or to incur the expense it involves. You are free to dub yourselves Doctors, and could you bring yourselves to descend to such courses, to undertake the cure of all maladies, and to treat all patients whom you could inveigle, by deceptive practices, to confide in false promises : there is no one legally to question your proceedings. Nor are you without inducement, if mercenary motives alone governed you, to follow this procedure. In every part of our country, nay, in every country, there are examples of its success. Empirics, a mere nostrum monger, the promulgator of any absurd system of doctrines and practice, will make more money than the most scientific and illustrious of the profession. The immortal Bichat trudged on foot the pavements of Paris, in his professional visits,

while the quack La Fecteur rode in his chariot and four. But the Rob Anti Syphilitic has already passed into oblivion and its vender nearly forgotten, while the glory of Bichat's name will be perpetuated to the latest periods of science.

Nor need you fear the frowns of an outraged community. The smattering of a little knowledge and shallowness of education almost universal, guarantee the success of empiricism; and society, incapable of judging of scientific questions, receives with complacency its pretensions, and sanctions it, when gainful, with approbation. A corrupt public press lends its stipendiary aid to every quackery and empirical humbug, that will fill its columns with profitable advertisements. Whoever pays is lauded. The columns of our public journals, with a few honourable exceptions, attest the correctness of this representation. An editorial homily on morality and the virtues, is illustrated in the next column by filthy advertisements of quacks and of nostrums, or others equally gross from their obvious attempts to allure the inexperienced by falsehood and deception.

Why is it that you turn from this easier path of empirical reputation and journal fame, for the toilsome and life-wearing pursuits of the medical student. Your brow will pale, and your form waste over midnight studies. The foul air of dissecting rooms, and the sickening emanations from the dead bodies, in which you must seek for the explanation of the symptoms and nature of disease, and the causes of death, to be traced in the ruins of the fabric of life, will infect your blood, impair your health and may endanger your life. Yet without flinching, with a moral courage quite equal to, and not less exalted, than the animal courage excited by the hurley-burley of battle-conflict, you undertake those labours, endure those disgusts and encounter those perils. A conscientious sense of duty impels you to fit yourselves, by a full preparation by study, and by calling in the aid of all the means of acquiring knowledge, to meet the responsibilities of a medical practitioner.

That so large a number of medical students governed by this high sense of duty, and acting on principles of this elevated order, issue every year from the body of the people, is indubitable evidence of the rectitude of sentiment and feeling that prevail among them.

It is besides shown by daily observation, that the confidence of the community, though occasionally perverted by deceptions, ultimately rests with the medical profession; and that those who manifest the greatest devotion to the cultivation of knowledge, and evince the highest attainments of science, are the most sought after and trusted in times of emergency, and in cases of difficulty.

That the medical profession does not retain in public estimation, the same position it held in times past, is undoubtedly true. Neither is it difficult to assign the causes of the change. It is the natural result of the advance of science, and the diffusion of knowledge. Two circumstances have principally wrought this change :

First.—In former periods, Medicine, devoid of the true principles of a science, had no means of viewing correctly its facts, or of interpreting them aright. No rigid code of logic, nor the severe rules of inductive philosophy, had laid the ground work of positive science. The imagination had no check to restrain its excursive flight. It solved all difficulties by the extravagancies of hypothesis, that none were able to refute. By the doctrine of occult qualities, medicine extended its sway over all nature. It set no limit to its assumption of curative virtues, with which it endowed every substance, and carried its pretensions to the wielding of all the powers of the universe. Medicine was regarded as a species of natural magic, and physicians were supposed to have opened to them the inmost secrets of nature.

As medicine, from the heterogeneous commingling of facts, delusions, assumptions and hypotheses, emerges into the defined and simple form of a natural science, physicians more modest in their claims, pretend to no higher ability, than to understand and interpret the laws and the phenomena of the animal economy in health and disease. These they profess to know, and undertake to regulate and to restore when disordered, by natural means derived from observation and experience. But this single and truthful character of medicine and of its capabilities, while it elevates it as a science in the eyes of the intelligent and learned, degrades it with the ignorant and vulgar. They look for the supernatural, and are satisfied with nothing less than miracles performed for their especial benefit. Their confidence, which in a period of ignorance, was given to charms, to amulets, and to incantations ; in a profoundly religious age was reposed in sainted relics, shrines and holy prayers ; in this unbelieving and superficial epoch, is transferred to charlatans, to humbugs, to quacks and to nostrums.

In the second place, the numbers of the educated were formerly limited, and those who had any pretensions to scientific knowledge were very few. The masses were exceedingly ignorant. The language of medicine being classical, every physician of any distinction was of necessity highly educated. Every department of mental culture ; the arts, every branch of letters and of science, have been largely indebted to the labors and contributions of the medical profession. While medical men thus ranged over the whole field of knowledge, medicine was

exclusively their own ; none but physicians could presume to an acquaintance with its doctrines, or its practice. There was a recognized distinction and superiority of the medical profession, from its learning and its science, that widely separated it from the general community. Does this longer exist ? Are the profession at large to be distinguished by their higher education, diversified attainments and general science ? Certainly not. It may be regarded as doubtful whether the educated portion of society are not ahead of the medical profession, and on some of the collateral departments intimately connected with medicine, infinitely better informed than many physicians themselves. The general education of the profession has not kept its relative superiority. It has sunk, while that of the community has been elevated. A cheap press, popular works and popular lectures on science, have placed most educated persons in a position to decide on the capacity, acquirements and professional knowledge of medical practitioners. Is it surprising that confidence should be forfeited, when it is found not merited ? or that a routine practitioner without education, learning or science, should not always be preferred to a routine empiric not more ignorant.

The profession have become awakened to this lowered standard of medical qualifications and educational attainments, Its authority in its own science, it is evident, is impaired by it. This is exhibited in the ready reception given to every variety of medical pretension, though rejected by the profession, and however absurd the doctrines and practice may be.

The subject of medical education is now in the hands of a committee of the National Medical Association, who will, I do not doubt, give it full consideration, and who will devise what can be done to abate the evil. It is a complicated question, surrounded with great difficulties. I may be indulged in some reflections on a question of this moment. Will it be possible to enforce, as has been suggested, a preliminary education on students of medicine, fitting them for the higher intellectual pursuits in which they are about to engage ? This may be effected in time ; it is most desirable it should be done ; but cannot be attempted at once. There must be preparation for the change.

In this country, where voluntary action of individuals enters so largely into all political and social measures, the first step is to produce a conviction of the existence of an evil and its disadvantages to society and individuals, and the good to both that will result from its removal. The work of reformation will soon, then, be accomplished, by the spontaneous action of our people.

The time for carrying out this measure is approaching. The prevail-

ing dissatisfaction in the profession is the indication of it. The students themselves will soon feel its influence, and acknowledge that it will be for their own interests. They will find that public respect and confidences on which their success in practice depends, as public opinion become, enlightened, will be withheld from the illiterate and uninformed, and can be obtained only by those who are well educated and thoroughly instructed. The Army and Navy Medical Boards have already shown to them, that the low standard of the medical schools, does not give the requisites of a well-educated practitioner; and that the diploma, conferred with little discrimination, is no evidence of qualification. The public taught the lesson, begin to adopt the same opinions. Every practitioner now feels that it is not on his vouchers he is to rely, but that the position he occupies must depend on the evidences he gives of his intelligence, general education and proficiency in his science.

Admitting the propriety, indeed, the necessity of a suitable primary education for medical students, it may be asked, what is that education, what should be its aim and objects? A collegiate course is the best undoubtedly, though I am not prepared to say the plan of instruction of most of our colleges, is the best adapted to train the student for scientific investigations.

But a collegiate course of education is not in the reach of numbers, who in this country, look forward to professional life, and many of whom constantly succeed in it by dint of application and ability; and reach its highest distinctions.

A classical education in times past was indispensable to the physician. Medicine was then a literature not properly a science: Its language was that of the classics: Its stores of knowledge, consisting of the history of diseases, observations of the outward symptoms of disease, and dreamy speculations of their causes and nature, were hidden from the vulgar in the dead languages. All this is changed. Medicine is no longer a literature; it is a science. It has taken its position, by wheeling into line, with the physical and positive sciences; of which, from the greater importance of its facts, principles and uses, it is destined to become the most eminent.

A knowledge of Greek and Latin can no longer be looked upon as an absolute requisite for the prosecution of a medical education. It is useful, as the terms of the science are either Latin or Greek, or are derived from them. An acquaintance with the classic writers of antiquity, is the accomplishment of a gentleman. By an intimacy with their works, noble sentiments are implanted in the mind, expansion is given to thought, elegance infused into taste, and a correct and polished style acquired.

Every physician who would aim at social and professional eminence, and to the acquiring of confidence and distinction, will find a classical education indispensable to his success. But science has disarrayed itself of this stately and elegant costume, and in our time it clothes itself in the language of the people. For the object of acquiring a knowledge of science, and for keeping pace with its progress, the modern languages, especially the French and German, are of infinitely more value and assistance to the student, than are the Latin and Greek.

The branches of education the best adapted to prepare the mind for the study of medicine, in its new relations and character, are geometry, or the higher mathematics, physics and chemistry.

The object of education should be to discipline the mind in the intellectual process by which it acquires knowledge; and in the methods of investigating and analyzing, by rigid scrutiny, the complexities of the compound phenomena, or facts of science, by which it lays bare the truth of facts; just as the brilliant gem, is separated from the dross in which it was concealed.

The spirit of geometry pervades all the physical sciences, and rules over all their operations and experiments. From the clearness, precision and order it imparts to mental operations, it may be looked upon as almost indispensable for the successful cultivation of science.

He who possesses it, is enabled to discover the fine thread, invisible to others, that leads through the mazes of the labyrinth that surrounds the shrine of truth and guides to its portals. He who has it not wastes his powers in fruitless efforts, or, at best, meets with partial success in imperfect results.

That medical science embracing as it does the phenomena of all organic nature, takes rank with the physical sciences; is occupied with the investigation of phenomena, for the most part entirely physical; is to be cultivated in the spirit, and in the methods of the physical sciences; and can be properly understood only by a previous acquaintance with them, will, I am confident, be made apparent by a short review of some of the most important organic phenomena, and by presenting to you the animal economy in the true point of view, in which it should be regarded.

All the functions of organic or plastic life, both in vegetables and animals, are purely chemical. The whole vegetable creation is a vast chemical laboratory. In it the chemical substances, carbonic acid and ammonia, are decomposed by the chemical forces of the sun's rays; and in it carbon, hydrogen, oxygen and nitrogen are combined, in various modes and proportions. In this immense apparatus are manufactured

in the mode stated, an almost innumerable variety of products. These may be briefly arranged under the following heads :—

1st.—Animal organic matter or protein compounds, albumen, fibrin, casein. They are the plastic materials of animal structure, existing in our aliment, from which the blood, tissues and organs of animals are formed, and an animal organism is constructed. In the order of creation, the vegetable must have preceded the animal world.

2nd.—Organic combustible substances, forming the largest portion of food, for the purpose of keeping up the animal, or vital temperature—an indispensable condition of vital activity.

3rd.—Medicinal substances endowed with an endless variety of properties producing general effects on the whole animal economy, or special influences on particular organs, modifying their forces, actions, structure and functions. They are in this manner constituted agents, which, when understandingly and skilfully handled by the instructed and judicious, may be employed with success in the treatment of diseases ; but which, in the hands of the ignorant and the rash, may prove dangerous and fatal.

4th.—Various substances useful to man, especially in a civilized state, for the purposes of protection, clothing and the arts.

The organic chemical actions of vegetables consist in the combining of the chemical elements, carbon, hydrogen, oxygen and nitrogen derived from the soil and air, and producing from them the aliment and other materials necessary to supply the wants of animals, particularly of man.

The organic chemical processes of animals are of an opposite character. They are decomposing and destructive. The animal organic substances, the protein compounds and the combustible organic materials that are formed by vegetables, are resolved back again into their primitive forms of carbonic acid, ammonia and water, and thrown out of the animal organism into the air and soil, when they again become the food of vegetables.

Organic chemistry in demonstrating this intimate relation and mutual dependency of the vegetable and animal kingdoms, and the eternal circle of the organic elements, has placed before the contemplative mind, one of the most beautiful harmonies entering into the universal harmony of creation.

The animal economy of man, in its diversified relation and conditions, physiological and pathological, the subject of medical investigations, is an exceedingly complicated mechanism. Our inquiries are greatly facilitated when the subject of them can be placed before us in a just point of view. We then know the nature of the inquiries we are to make,

and the spirit in which they are to be conducted. For this reason I shall proceed to present to you in a condensed form, what I conceive the animal organization to be, the nature of its machinery and what are the objects for which it is formed.

The animal organic mechanism is a locomotive engine, in the perfection of its machinery and adaptation to its purposes, infinitely beyond any similar engine, that man ever can devise. It is composed of a number of distinct mechanisms or machines, by which it is self-formative; by which it procures and prepares the materials for its repairs and renovation; conveys them to every part of its structure; generates its own temperature and the forces that put the machinery of its physical powers in action; and repairs the hourly wear and tear of its incessant working.

The intelligence for whose use this engine exists, whose will it obeys, whose work it accomplishes, that rules and controls it with unresisting sway, resides in and is a component part of the machine itself. The intellect is to the human locomotive what the engineer is to the steam-locomotive. It employs the extraordinary powers of this wonderful and magnificent mechanism, to mould exterior material nature, after the ideal creations of its own interior and spiritual nature. The state of society of any country, its institutions, its works, its science, its arts, the meliorating features impressed on the rude face of nature by its industry and labours, are the reflection of the intelligence, knowledge and moral condition of the aggregate population.

By his locomotive machinery, aided by his inventions to render it more efficient, man overcomes all the barriers and obstacles of nature. No mountain is so lofty as to be inaccessible to his footsteps; no valley into whose depths he will not penetrate: he mounts into the upper regions of the air to gratify his curiosity; he perforates the earth and descends into its bowels thousands of feet below its surface to bring forth its buried treasures; the wide expanse of ocean he has made his highway; and he circumnavigates the earth in the pursuit of pleasure, science or wealth.

The amount of physical power produced and expended in the daily working of the animal locomotive, is far beyond what would be conceived of by those who have not investigated the subject. When a man moves his body one foot, it is clear, that a physical power, equal to the weight of his body, has been expended and destroyed. If his weight should be 140 lbs., and he has moved his body 1000 feet, he must have expended 140,000 lbs. of power. But a man is able to walk from 20 to 30 miles a day, and even to carry on his back a burthen in addition to

his own weight. In this effort, the expenditure of power will amount to some millions of pounds. Other examples might be given, but time will not permit me to enlarge on this topic, and I will merely add, that the general computation of engineers is, that a day laborer, in good health, in a day of 17 hours, will raise 2,000,000 lbs. one foot.*

The exterior muscles and the bony skeleton, with its joints or hinges, springs and levers, compose the machine for the locomotive faculties and mechanical power of animals. The interior muscles execute the mechanical actions of the interior mechanisms—those of digestion, the circulation, and in part of respiration and the voice.

The muscular system exhibits in its construction the perfection of geometrical calculation. Every muscle is the solution of the following problem :

What is the form and arrangement to be given to contractile fibres, to obtain the greatest amount of power exerted in a given direction, consistent with economy of space and symmetry of figure?

Though the muscular power is the element of physical power, and it always contracts when that power is exerted, yet it is a singular fact, that the power exerted does not correspond with the extent of the contraction. It is the reverse. Schwann has proved by actual experiment, that the highest power of muscle is obtained when it is least contracted ; and its greatest degree of contraction is attended with the lowest sum of power.

While the muscular system exerts the power that accomplishes locomotion and physical effects, its action is not self-produced, but is always excited by a neuro-dynamic force, the machine or apparatus for the production of which, are the anterior centres of the spinal axis, the medulla oblongata, and the nerves, devoid of ganglia that proceed from them to the muscles. This dynamic force, the nature and generation of which, are not yet clearly ascertained, is the exciter of muscular action. The power of the muscle depends on the sum of this nerve-force, while the capacity for and endurance of muscular exertion, results from the rapidity and duration of its production. Great differences prevail with individuals in this respect, and with the same individual under varying circumstances of his economy.

Advice and directions to patients respecting their exertions, their labors and their exercise, require, on the part of the physician, if he would not make serious mistakes, a knowledge of the human locomotive machinery and its laws.

* Coulomb.

The concurrence of physical power is equally shown in all the great functions: they are dependent on it for their performance. Respiration, voice, digestion, the introduction of the ingesta and expulsion of the egesta, are all accomplished by physical power.

In no other of the internal functions do physics enter so largely as in that of the circulation. Its apparatus is an hydraulic machine unrivalled, as it ever must be, by any contrivance of man. The object of this machine is to irrigate the microscopic elements, the organic molecules of the animal tissues, with the plastic fluid for their development and re-production, and for conveying oxygen and caloric,—three indispensable conditions of vital or organic action, to every living molecule.

This is accomplished by a system of tubes and a forcing pump (the heart.) The supply tubes, (arteries,) carrying the fluid from the heart into the irrigating system of capillaries, are endowed with elasticity. The reaction of this property extends the propulsive power of the heart, or forcing pump uninterruptedly through the whole extent of these tubes down to the capillary region.

In hydraulic machinery human art has attempted to obtain a corresponding result by the contrivance of the air-vessel, pistons working in succession, or by the returning stroke of the piston being made, by an arrangement of valves, to act on the column of water and propel it continuously forward. This arrangement is to be seen at Fairmount water-works, and is the most ingenious that has been devised. But all are clumsy and imperfect in comparison to the hydraulic machine for the distribution of the blood in animals and in man.

The working of this machine is accomplished by the property of contractility residing in the muscular fibres of the heart, and the neuro-dynamic force generated in nerve centres, exciting that property into action. The sum of this force expended in the maintenance of the action of the heart, and of consequence of the circulation, and of the existence of the indispensable conditions of vital activity in the organized molecules of the tissues, is very considerable. It may be estimated by the amount of its performance.

The heart expels with each contraction, in a state of vigor, two ounces of blood. The whole column of blood in the vascular system, is moved at the same moment and in the arterial vessels with the same force and velocity. This is repeated 60 times in a minute, which is an expenditure of 450 lbs. per hour, or 10,800 lbs. in a day. This is the performance of the heart in a vigorous state of health, receiving its due supply of motor force. But when the neuro-dynamic organs fail in their office,

and the force is not generated in full energy, the quantity of blood projected from the heart lessens in quantity and is driven with less power. In the great capillary system—the domain of the vital actions—the vital activity declines and finally ceases, from the failure of the heart to maintain in them the indispensable conditions of organic life—plastic material, oxygen and a due degree of temperature; and death is inevitable.

An investigation of any other function would equally show its connexion with physics. Sight, hearing and the voice, partake so much of physics, that optics, acoustics and vocal sounds, are as much a part of physics as of physiology. They are the subjects of separate chapters in most treatises on physics. But I will not press the subject further. There is, however, one consideration that from its importance in practical medicine I cannot pass by without bringing it to your notice.

The neuro-dynamic force determining and regulating all the physical actions of life on which depends movement, is thus shown to be the Acting or Physical Force of life. It has been confounded with, but is entirely distinct from, the Radical Force of life, on which depends formation or organization.

This force, generated in the economy, is a function of an especial nervous apparatus. It has no fixed condition. It is probable, that it is evolved by the chemical actions now demonstrated to accompany all the actions of organic life. It is evidently connected with animal heat, one of the results of chemical action; and caloric is a source of mechanic power. This force fluctuates like the functions, and is subject like them to variations in intensity of power and regularity of action.

The production of the neuro-dynamic force; the sum of its power, is closely associated with the exterior supplies of the economy; that is, of oxygen, of plastic matter, of combustible elements, and of the evolution of caloric in the blood. Its mode of action depends on the state of the nervous centres, that direct and regulate it. It has therefore nothing of a fixed character; it is not an unlimited sum that may be drawn on without stint, as many appear to suppose. A just economy of this force, the management of it so as never, if possible, to expend the whole sum daily produced, or of taxing its machinery to the full extent of its capacity, is the great secret for preserving and enjoying health and life. A reckless expenditure of neuro-dynamic force, an overworking of its apparatus, is a common and constant source of suffering, decay and premature death.

The adynamia and ataxia of pathologists, mistaken by them as states of the economy, are symptoms indicating the condition of this force.

Adynamia is the indication of its deficiency, of the absence of power in the nerve centres ; ataxia is the result of the irregular, or perverted actions of this force, or of its organs.

These symptoms may exist as simple nervous diseases without complications, as in pure nervous adynamia, in which the patient, apparently otherwise in good health, is exhausted by very moderate exertions, even to an extent that may prove fatal. Pure nervous ataxia is shown in the spasmodic diseases, and in the neuralgias, and reaches its greatest intensity in tetanus and hydrophobia.

But it is of more importance to recognise and to understand these symptoms, when they are complications in other diseases, and more especially in fevers. In typhoid fever, adynamia, the loss of neuro-dynamic force and consequent failure of the physical and acting force of life, is a constant symptom ; ataxia or its irregular and perverted display of power, is more rare, but is often met with. In typhus, ataxia is a more frequent occurrence than in typhoid fever. It is more especially however, in pernicious, or irregular intermittents, so common in the Southern states, and confounded with other fevers under the unscientific and often erroneous name of congestive fever, that ataxia so frequently manifests itself as a complication, producing a great variety of anomalous symptoms, which, if misunderstood, and improperly treated, render those cases mostly fatal.

The preceding sketch will suffice my present object, which is to prove to you, that the animal fabric is a complex machinery, built on a plan purely physical and worked after physical laws. A knowledge of physics and geometry, the ruling spirit of all scientific investigations, must lend the most material assistance in obtaining correct views of the structure of the animal economy, the nature of its operations, and the laws that preside over them. In this respect this knowledge is of the greatest importance to the medical student.

The Institutes of Medicine, the chair of which I have the honour to hold in this University, is appropriated to the teaching of medicine in its character of a science. Its object is to ascertain the true nature of the numerous and diversified facts of medicine ; to examine and arrange them in the classes to which they belong ; to dispose of them in their connexions, relations and order of succession to each other ; and in this manner, directed by a strict scrutiny and a rigid logic, to arrive at the general laws and principles that must lie at the root of medical, as of every other science.

The Institutes of Medicine are not, then, as you perceive, physiology correctly defined. This is a common misapprehension with students

and also physicians. The institutes include physiology, but embrace equally pathology and therapeutics. Physiology is the investigation of organization in its development from the formative germ-centre to the completed organism, both in structure and function, and whether vegetable or animal. Physiology has many applications. The Institutes apply the facts and principles of physiology—the laws of the normal structure and healthy actions, to the elucidation of disease, or anormal structure and actions ; or in other words, to pathology.

The same law that determines and produces the evolution of the whole organism, or of any particular structure, and the laws that regulate their offices ; those same laws disturbed by perturbing agents, are the immediate causes of structural alteration and functional disorder. In therapeutics the same observations apply. The remedial agents that are endowed with active properties, that are capable of producing positive effects available in the treatment of disease, must modify directly or indirectly the organic structural laws or the functional laws, and thus the principles of therapeutics must be drawn from physiology. The Institutes of Medicine are, then, in their true acceptation, general physiology, general pathology and general therapeutics ; in other words, the whole science of medicine. The term implies this : it is equivalent to what in jurisprudence are named *Corpus Juris*, or whole body of law, and the Institutes of Justinian, which composed the Roman or civil law, that from the correctness and extensive applicability of its principles has descended to our own time.

The field of inquiry the Institutes occupy is, you perceive, extensive. In the limited courses of our medical instruction, it is not possible to do more, than enter upon a part of the subjects embraced in our investigations. That part will be the ground work, the primary facts and elementary principles, from which issue organic laws of extensive application. Throughout our course every opportunity will be taken to show the connexion of physiology with pathology and therapeutics, and in how clear a manner the one is frequently elucidated and aided by the other.

In researches of this extent and character, an acquaintance with some branches of knowledge is required, in which some of you are doubtless deficient. Such of you will have difficulty in comprehending, at times, propositions laid down, inferences drawn and views enforced. But be not disheartened. This very difficulty will convince you there is that you ought to know ; and to use the words of Sir Walter Scott, you will puzzle up to it until you do know it. This is better in my opinion, than, by levelling down to your imperfect knowledge, to dismiss you

from this school in the delusion that you know all that you should learn and that is necessary for you to study. Superficialness is worse, and more dangerous than ignorance.

In instructing you in the important department of medical knowledge placed in my charge, I promise you that what abilities I possess will be exerted to the extent of my power. I ask the same of you. Let us perform our duties to ourselves and to each other, in a spirit determined to succeed, and with the blessing of God, we cannot fail.

