VALEDICTORY ADDRESS
TO THE
GRADUATES
OF THE
UNIVERSITY OF MARYLAND,
SCHOOL OF MEDICINE,
DELIVERED AT THE
COMMENCEMENT
Held on the 4th of March, 1865,
BY
CHRISTOPHER JOHNSTON, M. D.
PROFESSOR OF ANATOMY AND PHYSIOLOGY,
PUBLISHED BY THE CLASS.

BALTIMORE:
INNES & MAGUIRE. PRINTERS,
ADAMS EXPRESS BUILDING.
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Prof. Christopher Johnston,

Dear Sir:—In discharge of the agreeable duty which has been assigned to us, we beg leave in behalf of the Graduating Class of 1865, to request for publication a copy of your Valedictory address, and trust that you will add to the gratification which its delivery afforded us by placing it at our disposal. We are very respectfully,

Your obedient servants,

William C. Poe,
Dennis C. Burch,
James F. Thompson, D. D. S.,
James E. Mitchell,
George L. Robinson.

Committee.

University of Maryland,
March 4, 1865.

William C. Poe, M. D.
Dennis C. Burch, M. D.,
James F. Thompson, M. D.—D. D. S.,
James E. Mitchell, M. D.,
George L. Robinson, M. D.,

Gentlemen:—

Your favor of present date requesting, on the part of the Graduating Class, a copy of my Valedictory address, is received.

As the address in question was prepared for you and has been delivered before you, I cheerfully accede to your desire, thanking you at the same time for the honor done me, and wishing you and the gentlemen you represent, all happiness and success. Truly yours,

Christopher Johnston.
ADDRESS.

GENTLEMEN:

It is impossible for a man to do anything in this world—to put into action any conception of his brain—which shall not exert its influence upon his life, and for much or little, for good or for evil, be or become an agent, irresistible in its sphere, forming a part of a combination which directs or controls his future. I leave to you to fathom the Past, and dredge up from its dark abyss the causes which have brought here together men so different from one another in feature, in physical endowment, and in the mode of exercise of the mental powers—in individuality, in short—yet all agreeing in the choice of a pathway which, you believe, must lead to honor, fortune and happiness. Indeed, judging by the eagerness with which you began your course, you promised yourselves no inconsiderable pleasure in the prosecution of the task you have set yourselves, in the pursuit of the great truths of Medical science, who drops into the hands of votaries who press her for favors a certain reward, but holds out the alluring temptation of joys and knowledge and power, which are forever lost to those who falter. I leave to you the discovery and recognition of the part you have yourselves taken in the creation of circumstances which have made you what you are—and, as "every intellectual act is the consequence of some preceding act, coming into existence in virtue of something that has gone before," I would disabuse your minds of the error of supposing a fate or destiny uncontrollable by the forces which are within you, as I would seek to show you that it is extremely remote from fiction to assume that really and practically man is the arbiter of his own des-
tiny. I propose to tread a little the mazes of generalization, which is Science, allowing others to make application specially of many of the chapters and verses into which the great Book may be divided.

I apprehend that you, gentlemen, have acquired a more or less precise notion of the plan and the structure of the human body and of the manner of the working of its parts, and of the sum of their action as a whole; you have learned to associate with the material framework an immaterial essence which makes it the seat of incessant commotion, and which for a definite period insures the integrity of the body in its entireness; and you have recognized that the mastery of the living organism is wielded by a subtle something, called the mind, inconceivable in its intimate nature, unknown except through its operations, and united with our being in a way so mysterious that all attempts towards the comprehension of the relationship have been vain and fruitless.

But very possibly you may not have attached sufficient importance to the great truth that no function or action of our body or of the parts which constitute it, or indeed of any living organism whatever, can be performed without material change occurring at the same time as a concomitant condition. In other words we may say that Life is action, and that every manifestation of the vital energy involves necessarily a determinate change in the physical constitution of the organized material structures in which such manifestation takes place. Thus we breathe the air of heaven, and this inevitable respiratory function rusts and wears the machine which must perish but for its continuance. The heart and bloodvessels by their contraction (principally) urge the living blood into intimate association with the molecules of all tissues, but heart, sanguiferous tubes and blood itself undergo a structural metamorphosis downwards in representative proportion to the action performed. The spleen does its office; the stomach and intestines elaborate the assimilative juices on which the stand-
ard average of all vitalized organic matter depends; the liver performs its function of double direction; and the kidneys labor incessantly in their life-permitting business of depuration; yet each of these processes in its performance demands a tribute of the organ in which it is accomplished, a tribute that we recognize under the appellation change, metamorphosis or wear.

To urge the point a little farther, I assert that for which you may not be altogether unprepared, namely, the invariability of the same law in its application to all the operations of the nervous system, performed both within and outside of the boundaries of consciousness; even to all the efforts of the mind exerted upon the remotest periphery of the body or in the convoluted labyrinth of the Brain—all these go hand in hand with partial but certain disintegration. If my mind contemplates itself, if memory recalls the photographed idealities of by gone years; if my spiritual self conceives a thought; or reason and judgment deliberate upon ideas, a creation of within, and impressions, wherever created, material change is the fatal accompaniment, and life makes a surrender to decay. If the senses be not in a state of Anesthesia—if the eye catches the undulations of luminous ether; the ear apprehends the rolling waves of sound; the olfactory nerve receives the stimulus of odiferous particles; the tongue conveys to the inner sense its perception of sapid matter; or the tactile organs awaken consciousness or sensation; a part of the living fabric crumbles into dust, as when also the will stirs resolve or desire, the brain and the pulse, illumines the flashing eye, or sways the mighty levers of the body and sets in high action the quivering cords of contractile power.

It may startle some of those who shut their eyes against Eternity and find Time so long that they use every artifice to become its destroyers, to know and be made to realize that we live prophetically, for the future, while we seem only to discharge the duties of the present. We are ourselves the "Destiny that shapes our ends" which many of us hew roughly indeed.
Whatever be then, the laws of Life, that is to say the generalized expressions of the observed phenomena of Life, it must be admitted that man is not without his influence in ordering the circumstances in which he lives and moves and has his being. He is privileged with selection in almost everything which nearly concerns him as an inhabitant of the Earth, as his free-agency also allows him to determine and fix his status in the world which is to come. — He cannot, it is true, force nature directly to bestow on him endowments she has denied him, but where one buries his talent in the ground, another may, by the assiduous development of his talent, increase his store in kind and enjoy the advantage he has secured. And besides, with such a man, capacity for enjoyment increases with augmentation of the means which contribute towards it.

It is unnecessary in this connexion to pass in review the natural causes and their operations which have existed and been in force for an immeasurable period of time, and which have had for their result the actual condition of everything inanimate or animated which forms the earth's crust or dwells in and upon it — or to show you how, under altered and altering circumstances, however vast be the period in which the changes were accomplished, arose among living things that "Variability governed by co-relation of growth, by use and disuse, and by the direct action of the physical conditions of life," which, with selection, has governed the arrangement of all forms of existence, that have withstood destructive agencies, as well as of those forms, overmatched in the "Struggle for Life," which have become extinct, and left no trace of their existence beyond their fossilized remains, preserved in geologic strata. It will suffice if I enable you first to recognize the power that man exerts over inferior animals, and the way in which it is applied; and then you may without effort be led to contemplate our own race — ourselves — in our physical relationship, and in the acquirement of mental power and capacity.
In dealing with lower animals, especially the domesticated varieties, man oftentimes fixes upon a standard differing materially from the ordinary type; and it is to his persistence in adhering to that type in discriminative breeding, that we now possess those different varieties of Horse, or Sheep, or Dog, or Cattle, or Domestic fowl. The Race-Horse for example, is singularly unlike the Hunter and the Coach Horse, and these depart widely in form, appearance and quality from the colossal brewery draught horse or the horses of Normandy. In the racer great speed in running, combined with good wind and endurance, are the qualities sought to be obtained and perpetuated. To accomplish the end in view, the breeder has for many generations selected for mating those horses only which possessed in the highest degree the qualities of speed and endurance; and as the racer's action is always confined to a level surface, it is evident that while particular groups of muscles are highly developed by training and inheritance, other groups of muscles become subordinate in use and development; and as a consequence of all the circumstances in which the horse is placed, of the habits imposed upon him, his bone must accommodate itself to the new and newer condition; and his food is concentrated—that is to say the greater part of it—his stomach and intestines are reduced in volume, thus contrasting strongly with the common nag, which grazes with the cattle; and as the result of all these combinations, we have an animal of beautiful but peculiar form, adapted to all the requirements of the turf, and showing by recognizable marks, or points as they are termed, the relation existing between the parts concerned in performing, and the work they are called upon to do.

By similar procedure may the original forms have been so greatly modified in the varieties of their descendants, the generic and specific characters only are preserved, if indeed, we may claim the persistence of identity of species. From the original Lithuanian cattle, now nearly extinct,
we have dissimilar Devons, Ayrshires, short and long horns and Durhams, all varieties of what are called "improved breeds." From the ancestral Wolf, or Dog, are descended the Shepherd's Dog, the Greyhound, the Newfoundland, the Esquimaux, the Terrier, the King Charles' Spaniel, and the White Poodle, varieties presenting the greatest differences, although agreeing in the retention of the characteristics of the genus which lead unmistakably to the recognition of the identity of their type.

Finally, I would adduce, as another example illustrating the possibility of breeding up to a type or standard, at one time almost ideal, the Domestic Fowl, in the varieties of which are to be found associated any and every desirable quality. The superb and heroic Game Cock, whether Red Derby or Black Spanish; the Dorking breed, strictly local as to distribution, so remarkable for size, flavor and abundant laying; the Polands, with their heavy crest, distinguished for docility and egg-production; and the Bantam Cock, a diminutive creature, but courageous and gallant as chivalry itself. The most remarkable of the Bantams is the celebrated "Sebright Bantam," a production, so to speak, of Sir John Sebright, as it exemplifies, better perhaps than any other, the positive results of special breeding towards a desired type. The Cock, as a perfect Sebright, must have "a clean, erect carriage; must be totally devoid of ruff and saddle features; must have a straight, square tail; and as for the general plumage, whether the ground color be 'silver' or 'golden.' each individual feather, except the tail, must be perfectly and evenly 'laced' or edged with black, the 'lacing' or border line being of a pure black about one-sixteenth of an inch in width; and it is quite essential that regularity should exist throughout the whole lacings, for if the line widens towards the extremity of the feathers, it becomes a fatal objection. The tail should be only tipped with black, and the ground color, golden or white, should not be clouded, but perfectly clear and distinct throughout its whole extent."
Whatever be the change eventually effected, it is not really a production. To use the language of Mr. Darwin, "Man does not produce variability; he only exposes organic beings to new conditions of life and then nature acts on the organization and causes variability. But man can and does select the variations given him by nature, and thus accumulate them in any desired manner. He thus adopts animals and plants to his own benefit or pleasure. He may do this methodically, or he may do it unconsciously by preserving the individuals most useful to him at the time, without the thought of altering the Breed. It is certain that he can largely influence the character of a breed by selecting in each successive generation, individual differences so slight as to be quite inappreciable by an uneducated eye. This process of selection has been the great agency in the production of the most distinct and useful domestic breeds. Many of the breeds produced by men have to a large extent the character of natural species; and this is shown by the inextricable doubts whether very many of them are varieties or aboriginal species."

Thus far, gentlemen, we have given attention to the positive variations which man may and can single out in animals and accumulate at will—disregarding, the while, other qualities, also variable, and capable of accumulation under suitable conditions. We have yet to learn why certain organs lose consequence progressively as others are fostered into a high state of development, and you will discover that it is no less interesting and instructive to observe the retrograde course of certain parts of living organisms than it is to witness the constantly increasing predominance of parts which find favor and encouragement in growth. Indeed, if I did not fear to weary you, I might establish to your satisfaction that nature, in pursuance of laws which man unconsciously follows, has brought about the extinction and annihilation of successive races of beings which have perished in the "struggle of life" and yielded
their places to races, differently endowed, that have supplanted them.

As life is the principle of action, and its appreciable expression is functional and other activity, the opposite condition inaction must stand for a dormant or a diminished vitality; and as it appears to be a law that there is no development without use, the inference is not a forced one that disuse must tend towards arrest of development.—"Disuse," aided sometimes by natural selection, will often "tend to reduce an organ, when it has become useless by changed habits or under altered conditions of life; and we can clearly understand, on this view, the meaning of rudimentary organs. But disuse and selection will generally act on each creature (in its natural condition) when it has come to maturity, and is called upon to play its full part in the struggle for existence; and the perpetuation of the disuse as our inheritance, coupled with progressive development elsewhere, must eventuate in modifications which become comparatively fixed and standard conditions. Thus the 'calf' among many instances which could be adduced, has inherited (a full compliment of incisor and canine) teeth (which never cut through the gums of the upper jaw), from an early progenitor having well developed teeth; and we may believe that the teeth in mature animals were reduced, during successive generations, by disuse, or by the tongue and palate having been fitted by natural selection to browse without their aid; whereas in the calf the teeth have been left untouched by selection or disuse, and on the principle of inheritance at corresponding ages, have been inherited (in their actual condition) from a remote period to the present day."

Indeed, the peculiarity of the dental formula, now constitutes one of the most striking characteristics of the order of ruminants—to which the calf belongs. We say that among animals having vertebrae, the class Mammalia comprises those which have two occipital condyles, with a
well ossified base-occipital, which have each ramus of the mandible (or inferior maxillory) composed of a single piece of bone and articulated with the squamosal element of the skull; and which possess mammæ and nonnucleated red blood corpuscles." And the Ruminants, an order of mammiferous animals, are specially distinguished by the absence of teeth in the superior maxillary and intermaxillary bones, as well as by having the cloven hoof, the four stomachs, and the forehead armed with horns supported by a bony axis.

I have thus endeavored to shew, although in a cursory way, that it is possible for Man to avail himself of laws under which nature has ever been and is still operating changes, affecting living things in their physical organization as a whole, in particular organs or groups of organs, and as to animals, in mental qualities or intelligence, by whatever name this endowment is recognized. I say living things, for although allusion, only, has been made to plants, yet the vegetable kingdom gives evidence of yielding to the same influences, of obeying the same laws—excepting always in respect of intelligence as we find it among animals—yet it would be far from reasonable to deny to Plants the appearance of a certain sort of instinct, as it would be contrary to observation to assert that some of the group have not the power of auto-motion. Who has not wondered at the sensitive plant shrinking from the touch; and who may not view with equal surprise the active movements of the fertilizing particles of many plants, especially of some sea-weeds or Algae, of certain fresh-water Confer-voids or Desmids which form the green ooze in ponds, ditches and still water, as well as of most mosses and ferns. Besides all this, forces are ever at work to effect the circulation of sap, or other nutritious fluid through the sap vessels, and also in the ultimate chambers or cells of which the plant is constituted; or in many of the Desmids, among others those consisting of but a single plant-cell. Under the microscope only can these circulatory currents be observ-
ed in their marvellous course. In the transparent cellular fronds of Chara, a delicate semi-transparent plant, common in ponds and ditches, minute green particles are seen to circle around the peripheral portion of the cell, starting at a given point, pursuing a constant direction down one side of the chamber, and coming up the other side to the place of beginning. In Nitella, also a ditch plant, the sort of circulation may be observed. In Closterium, a minute green, semilunar one-celled Desmid, there is a circulation of fluid and suspended particles in the principal cavity, and a constant rotation of infinitesimal red bodies in little secondary chambers situated one at either end of the half-moon Closterium. But nowhere in the vegetable world does motion so much perplex and astonish the beholder as in another sort of microscopic vegetable, a Diatom known as the Paradoxical Baccillaria. It consists of a number of thin rods, one two-hundredth part of an inch in length, resting sideways upon one another, and resembling, when seen in front the slats of a Venetian shutter. These rods glide upon one another until, in the whole chain, they touch or adhere at the extreme points only, but without becoming detached, forming a slightly zigzag line; and then some or all the rods start off in a contrary direction to recommence their perpetual gliding motion to and fro. I might multiply examples of vegetable movements, in some instances apparently guided by will and choice; but enough has been said about plants to illustrate the points which they raised in discussion.

I have said that it is possible for man to accomplish change in inferior animals and to choose in what that change shall consist. It is also certain that he can wield the power, slowly to be sure, but with an eventual success of which I have adduced some of the proofs. He has left his traces everywhere around him—he has asserted his dominion over mere strength and ferocity—he has subdued into domesticity a great number of creatures whose very nature and even fecundity he has controlled. But what
has he done for himself? And here arises, as Mr. Huxley says in his "Evidence as to man's place in nature," "here arises the question of questions for mankind—the problem which underlies all others, and is more deeply interesting than any other—namely, the ascertainment of the place which man occupies in nature and of his relations to the universe of things. Whence our race has come, what are the limits of our power over nature, and of nature's power over us, to what goal we are tending, are the problems which present themselves anew and with undiminished interest to every man born in the world."

"Identical in the physical processes by which he originates—identical in the early stages of his formation—identical in the mode of his nutrition before and after birth, with the animals which lie immediately before him in the scale—man if his adult and perfect structure be compared with theirs, exhibits as might be expected, a marvellous likeness of organization. He resembles them as they resemble one another—he differs from them as they differ from one another." "If we exclude from propinquity and comparison those animals to which man does not obviously belong, there would remain but one order for comparison, that of the Apes, and the question resolves itself into this—is man so different from any of these apes that he must form an order by himself? Or does he differ (as little) or less from them than they differ from one another, and must hence take his place in the same order with them? Our knowledge shows us that Man is, in substance and in structure, one with the brutes, but our reverence for the nobility of manhood will not be lessened by that knowledge; for he alone possesses the marvellous endowment of intelligible and rational speech, whereby, in the secular period of his existence, he has slowly accommodated the experience which is almost wholly lost with the cessation of every individual life in other animals; so that now he stands raised above the level of his humble fellows, and transfigured from his grosser nature by reflecting, here and there, a ray from the infinite source of Truth."
What Man was in his earliest condition is as impossible for us to know as it is to determine the date of his appearance upon the earth. His fossilized remains and the fossilized work of his hands awaken ideas concerning our race at a time when Man, the great fossil Elk of Ireland, the Woolly Rhinoceros and the Siberian Mammoth, lived contemporaneously. The human skulls and bones mingled with the bones of animals, some of which are now extinct, all found in the caves of Engis, in Belgium, and of Neanderthal, near Dusseldorf, carry us back to a period of "great but uncertain antiquity," which, again, may be surpassed by that marked by relics recently discovered in France, in the cave of Bruniquel. If we include Man in the order of Primates—an order which would comprise the other Apes—and if modern research constantly carries back the antiquity of man to a more remote period, where must we look for primæval Man? and what may we expect to find when we discover him? Will we meet in the old strata of the earth, with the fossilized bones of an Ape, more manlike, or a man more apelike than any which have as yet revealed themselves to the palæontologist?"

Let us find an answer to the question, What has Man done for himself? Certainly, between the earliest supposable man and the man of this year of the world—and who can realize so colossal a cycle?—there is a vast hiatus. But the most ancient races of men known to us—and who are moderns, compared with the absolute first men—must furnish the comparison, and not the possible existences of ultimately remote ages. We find evidence of that rude savage life, with few resources, which differs in little from the modes of living of rude and savage tribes of the present day. The whole race, however, has not lain dormant—a part of the barbarous hordes became tillers of the ground, and builders, and navigators, and at first combined physical with mental culture. But as civilization progressed, as the brain and intelligence were developed, physical improvement of the race was again and again lost
sight of, and, with the exception of the palmy days of Greece, was held in high estimation then, only when ignorance was the prevailing character of the age. Among the brutes, those only are privileged to reproduce their kind which are the bravest, the hardiest, the strongest. But man mates after his own inclination, the strong with the weak, the feeble with the feeble, the sickly with the fragile, the giant mind with the glimmering intellect, the tall with the little, and the robust with the starveling. Has man practised in his own race the selective breeding which he has persisted in with regard to his inferiors, and allowed only the most vigorous individuals to leave progeny or the most progeny? Individual excellencies of every kind have been recognized and appreciated, but no constant means have been adopted to perpetuate these qualities. Nevertheless Nature works on ever, with selection, use and disuse, and the mass of minds tends towards a higher level, while the human body seems to have undergone no recession. It is a singular and significant fact that the old armor used in the famous Eglington tournament was never too large, although often too small, for the modern nobles who engaged in the sport.

If I have made myself understood, gentlemen, in a brief consideration of a subject of vast scope, and deserving of profound reflection, you will have apprehended that instability is one of the attributes of existence, that change is inevitable, and that change and incessant movement are life itself, and you will also have perceived somewhat of the extent of our power over nature, and of nature's power over us—and that this power is not wielded by the mighty and the gifted only, but by every human being sent into this breathing world. In the unceasing commotion of life there is a constant building up and an incessant tearing down of the fabric of our bodies. Every action, every passion, every thought, induces or hastens disintegration; may, even the effort of the will to restrain, is the inevitable precursor of molecular decay. But use, determining wear,
also calls into activity forces which not only repair waste, but promote development; whereas disuse tends as certainly in a downward direction, towards rudimental inconsequence. If nature slowly but fatally works out her perfections: if man accumulates and controls at will the qualities and form of his humbler fellows: if the blacksmith or Dr. Winship develop their brawn and wield the ponderous sledge or lift half a ton, what cannot man accomplish by the constant exercise of all the noble faculties of his mind and heart. These faculties, like the organs with which they are associated, are not exceptions to the laws which govern material organizations, and use and accumulative selection must inevitably result in expansion and vigor and power. The secret of all these developmental operations is perseverance, untiring and perpetual, in all that is good, and honest, and noble, and of good report, as all that we think, or determine, or do, tends to make us what we shall be. Thus a retrospection of the Past, and an attentive consideration of the fleeting Present, may afford a certain ground of faith in the attainment of a nobler Future.

It only remains for me, now, gentlemen, to say a parting word. From this day you assume responsibilities which it becomes you well to regard most seriously. By resolve, by study, by the stimulus of duty, you have made yourselves what you are. But with your independence you have only achieved an entrance into the real arena of life, and yet with zeal and self-reliance, what can you not accomplish for, and in the future which lies before you. Let not your aspirations be quieted by the attainment of your first honors, but learn, rather, to strive and labor for the development of your innate forces. And in each trial, each struggle for the mastery of circumstances, and every advantage you gain, be assured that you have no warmer sympathizers, no well wishers more sincere, than your former teachers, the Faculty of the University of Maryland.