An address delivered at the opening of the classes of the Medical School attached to the Middlesex Hospital, October 1st, 1845 / [Alexander Shaw].

AN

ADDRESS,

DELIVERED AT THE OPENING OF THE

CLASSES

OF THE

MEDICAL SCHOOL

ATTACHED TO THE

MIDDLESEX HOSPITAL,

OCTOBER 1st, 1845.

BY

ALEXANDER SHAW,

SURGEON TO THE HOSPITAL, AND ONE OF THE LECTURERS ON SURGERY.

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AN ADDRESS,

&c. &c.

In ancient times, if we may credit our Livys or our Sallusts, it was the custom of the General commanding an army, when breaking up their winter cantonments, and commencing a new campaign, to mount a rostrum, and deliver an Exhortatory Address to the soldiers. You are assembled here, some like troops who have seen service, to resume the toils of a new session; others, like newly-enlisted soldiers, to engage in arduous labours, from which you look for honours and rewards. It is the established custom of the schools in the metropolis, to seize this opportunity for one of the Lecturers to deliver remarks, which may prepare you for the course of rigorous and severe study appointed for you to follow, and may animate you with proper zeal to pursue your occupations with manly courage and unshaken perseverance to the end.

If, however, I correctly judge of your present feelings by what I can easily recall of my own, when I sat, like yourselves, before a revolving table such as *this*, on the first day of October, upon a new session commencing,—I would say, that it was a superfluous part of an Introductory Address, to use language for inspiring ardour, and exhorting to work. There is not one amongst you, I may safely assume, whose bosom is not filled with an ardent desire to engage in the la-

bours of the course; and who has not a high ambition to outstrip his fellow students, in the race of excellence. You have been recently enjoying holidays,—passing your time idly—or, at least, in relaxation from severe or anxious duties: and it is natural, in every well-constituted mind, even before the allotted period of vacation has expired, to feel weary of such application of precious days, and to resume the useful employments of life, with fresh zeal and energy. With many of you, the professional studies you are about to undertake, are new; and have all that inspiring influence which novelty, and a consciousness of being introduced, for the first time, to subjects which will engross your minds, and be the main occupation of the whole of your future life, are calculated to produce. Lastly, you are still in the season of youth; that period when hope inspires to noblest exertions, and when your faculties, elastic and fresh, are most capable of varied application, and your minds of receiving strong and lasting impressions,—a time, when the currents of enterprize flow with fullest tide, when a man's bark floats with greatest buoyancy, and he spreads every stitch of canvass to the winds. There is enough, then, of ardour, and laudable good intentions in your dispositions; —but I may, perhaps, perform a meet and friendly office, if I entreat you earnestly, to attach a just value to that zeal, and do not suffer it to expire. Cherish it, not only for present use; or to last out the current session; or till your studies for qualifying you to practice, are finished. Resolve to retain it for the whole of your after life.

It has been my lot to witness the private course of life of individuals in our profession, who have become

eminent. You have, I question not, taken pleasure in reading the memoirs of wise and good men, distinguished in science, and whom the world delights to honour—and has it not struck you how much their success and fame have depended on their possessing a strong will, and an ardent, hopeful, disposition, such as we see in youth? While their reasoning powers have been ripening by exercise, their intellects becoming more fertile by acquisition of knowledge, and their judgments more vigorous as they rose to manhood, they have taken care to preserve alive the fire which animated them in their early days. The soil of a man's mind may be rich—the seeds planted in it capable of bringing forth good fruit; but if a genial warmth, like that of the sun's rays, be not diffused over it, by zeal such as you now experience, and continue to shine, not only in the spring and the summer, but the autumn, of life, the harvest will not be gathered in.

A great man, speaking of his own profession—the Law—has said: "It is a science which employs in its theory, the noblest faculties of the intellect: and exerts in its practice, the cardinal virtues of the heart." These beautiful words we may borrow, and justly apply to the profession we have chosen. The subjects of study which form the basis of Medical science, extend over a greater number of the different provinces of knowledge, than in any other profession: and the practice of it, by giving us a direct and daily interest in the sufferings of our fellow creatures, carries along with it the purest principles of charity and benevolence.

In an address like the present, it is allowed, to take a general view of the chief subjects included in a system of medical education; and by selecting some more

prominent one, to comment upon it; and show by examples, in what spirit our investigations ought to be pursued; and the character which a medical man ought to endeavour to establish. "It is only by forming for yourselves a just and dignified conception of the duties and offices to which your life is to be devoted, that enthusiasm in study, and a liberal, independent, and manly spirit can be nourished."*

However numerous and varied (as our prospectuses show) may be the distinct subjects provided for your instruction, you will soon perceive that they arrange themselves under two principal departments. It being the common design of all parts of a medical education, to qualify you to discriminate diseases, and, as far as human means are available, to counteract and remove them—a natural division presents itself; First, into those branches of study which acquaint you with the healthy structure, and natural properties of that body which is to be the object of your ministering care; and Secondly, those in which diseases are classed and described, and the appropriate remedies pointed out.

Attending to the first of those departments: it requires no argument to show, that, for an Engineer, who has a complicated engine to preserve in condition, and to repair when out of order, the first duty must be to acquire a thorough knowledge of the construction of the machine, and then to learn the principles on which the different parts act. So, for a Medical man, in undertaking the charge of the human machine, the first step in his education is to study the ANATOMY.

That important branch is to be examined in two

* John Bell.

ways:—First, you are bound to learn accurately the different organs; making yourselves acquainted with their forms, textures, relative positions, and the technical names applied to them. This constitutes the division called "Descriptive Anatomy."

Such knowledge is obviously indispensable to the medical man. For understanding the most common injuries, the most common diseases, it is imperatively required. Without it, he could never decide correctly what structures, whether important in their nature or not, were involved in any accident or any morbid process. The medical practitioner ought, in short, to be as intimately acquainted with all the structures beneath the skin, as with the faces of his nearest relatives. But to conquer that knowledge, the student must arm himself for a severe conflict. In the whole body, the parts to be learned are as if *inexhaustibly* numerous: in the different systems of organs, the objects are so like each other, that it is extremely difficult to retain the distinctions between them in the memory: in the "regions," where it is of the highest importance to know the relations of the structures accurately, the parts vary so much in proximity, even in a small space, —changing their relations, as it were, capriciously, at least, without any apparent general rule,—that the mind is very apt to get confused. Again, the forms of the different organs, although fashioned according to the highest wisdom, are yet so inconceivably varied in contour and outline,—so unlike the symmetrical, straight-lined, or curvilinear, regular shapes, generally met with in human mechanism,—that it is exceedingly difficult to carry the impression of their figures long in the mind. Hence, I venture to say, that however ex-

cellent may be your memories, you will be obliged to learn, and relearn, and learn over again, the various intricate parts before becoming completely masters of them. Having in one month of a session conquered a particular division of the body—say the arm or the side of the neck—you will be mortified, at the lapse of another month, to find your knowledge has escaped; and having returned to the combat, and relearnt the part, you will soon after find, to your discomfiture, that it has again, if not wholly, partially vanished from your memory. But be not cast down by such disappointments. The labour will not always be that of Sisyphus. "It will rather be like kicking a foot-ball up hill: you kick it onwards 20 yards, and it rolls back 19: still you have gained *one yard:* and thus, in a good many kicks, you make some progress."* By degrees, the holes in the sieve will get clogged. Soon your memory will hold more and more. The knowledge of one part, by association, assists that of another, till the structures are so connected and arranged in your memory, each in its proper place, that when you direct your attention to one part, you can penetrate, as it were, with your mind's eye, into the interior, and see them as distinctly as if disclosed by dissection. When you have reached that agreeable stage of knowledge, your triumph is great; for the knowledge remains permanently fixed. Let any one conduct you, then, blindfolded to the side of the dead body; you will throw a ligature round any of the arteries almost as readily as if your eyes were open: or, having transfixed the body with the catlin, you will think nothing of enumerating correctly and rapidly, all the successive

* Dr. Arnold.

structures through which it has passed. Manfully and perseveringly, therefore, encounter the labours set before you. Irksome and dispiriting as the process will be, I cannot represent sufficiently strongly the satisfaction you will derive from succeeding in the effort. It will give you a sense of confidence,—a consciousness of power in difficulties,—which, besides lessening anxieties, will exercise the most favourable influence on your professional character, by the readiness and decision they will impart.

Such, then, is *one* mode of examining the structures of the human frame in studying anatomy. According to it—"The dry bones have come together, bone to his bone; the sinews and the flesh have come up upon them, and the skin has covered them above—but there has been no *breath* in them." The body has lain stretched out before us—a decaying mass, sans touch or motion—offending the senses. We must next view it—*instinct* with life; all its members and organs in active operation—possessed of endowments, which elevate it to the highest rank amongst the works of the Creator. That study is Physiology.

So attractive is the department of physiology, that it were a needless task to exhort you to pursue it. The wonderful processes of the economy, to the knowledge of which it introduces you, will take the most powerful hold of your minds. And your interest will rest on a more solid basis than mere gratified curiosity, when it is considered, that the facts disclosed by this study are the chief elements of our reasoning upon questions of disease. But the intimate relation which physiology bears to other sciences, not strictly coming under the head of medical studies, gives it a new claim to your

attention: it forms a connecting link between men of different professions and ourselves—a common ground on which we meet to exchange mutual advantages.

I do not conceive that I can be more advantageously employed, than in directing your attention to one or two examples of important general deductions derived from the study of physiology. They will illustrate, better than precepts, the mode of prosecuting such enquiries, and the practical application that may be made of the laws so obtained.

It being our special province, as Medical men, to preside over the health of the body, and to regulate (as far as lies in our power) the actions when deranged, so as to restore them to a sound condition, it behoves us, assuredly, to enquire, How the textures resist the effects of the constant "tear and wear" of the system; so as to continue in workable order, and preserve their integrity, during a long life,—and How *we* possess any power of modifying the actions so as to repair injuries. Researches in physiology throw important light upon these questions.

If you were about to construct an extensive and expensive piece of machinery, what would be your chief object of solicitude? Would you not be anxious to procure materials of the most *durable* quality? You would select iron when it was possible; and for the wood-work, ropes, &c., you would probably enquire into the value of Sir William Burnett's patent, or endeavour in some way or other to protect them against rot. However, notwithstanding your utmost care, the machinery would, ere long, begin to get out of order: a rope would be worn and crack—a rod, or wheel,

would break, and the work be entirely deranged. How would you proceed to rectify the mischief? You would be obliged to hire skilful workmen; set them to take down the damaged part, and replace the broken wheels or rods by introducing new ones. Such is the common proceeding in works of human invention.

But very different is the process in the living frame! It is by a very wonderful means that the body is kept in good order: and what is still more remarkable, the same living processes which keep it in workable condition, enable it to throw off diseased or injured parts, and repair itself!

You will not have advanced far in your studies, before you will be convinced of the truth of *this* striking and almost incredible fact—That at each instant of your existence, every minute particle of your body is undergoing a change. From the first moment you "smell the air," and come into this breathing world,—"wawling and crying," till the last pulse at your wrist—the whole material of which your body is composed, solid, soft, liquid—is passing through a successive series of changes—you are never two days consecutively made of the same substance—never two days following really the same individual!

How is that wondrous effect produced? I can only describe the process generally.

The circulating system is the main instrument employed. The blood contained in the veins and arteries, rushes through the various members of the body in a continuous rapid torrent, and visits every spot, to the minutest visible particle. One part of the blood is in communication with those organs by which new material, in the shape of food and drink, is introduced into

the system: that is, from the digestive organs there pass off a set of vessels, the lacteals, which imbibe the nutritious juices from the assimilated food, and convey it into the common reservoir, to enrich the qualities of the blood; while another part is in connection with excretory organs, which cast away the old material in the shape of solids, fluids, gases,—so as to cause a corresponding drain upon the system. Now physiologists are able to demonstrate, that even in the most solid structures—the bones—some of which are as hard as flint—as well as in delicate tissues, like those of the eye—a constant degradation is going on, simultaneously with a reconversion into material similar to what had previously existed. And these two opposite processes,—a pulling down of the body, on the one hand, and reconstruction, on the other,—depend on the blood visiting the parts. The molecules of the frame, when dissolved, are converted (strange alchymy!) into a fluid identical with blood—(it matters not whether the structure has been bone, ligament, muscle, or nerve, the resultant fluid is always like blood!)—and being now introduced into the circulating system, the old material is submitted, in its condition as blood, to the action of the excretory organs, and finally expelled out of the system. At the same time, the enriched blood, transmitted from the heart, furnishes new and fresh material to replace that carried away: that is, what was one moment food, is in another moment blood; and that, again, is in another second either bone, muscle, brain!

By this continual exchange, of new material for old, and incessant transition, the body is ever kept fresh and young. And the most marvellous thing of all is, that during a whole lifetime our *identity* is preserved.

Variable and transient as are the corporeal parts of our bodies—metamorphosed as they are from day to day, our acquaintances have never any difficulty of recognizing us: we have always the same figure, the same features, the same colour of hair, the same complexion. A force resides in the interior of the body, which, amidst the changes going on, controls and regulates the processes, so as to maintain the persistance and stability of the structures. "In the vortex of changes, the matter is fugitive—the form, the plan of the edifice, is the permanent element."*

Hence it has been well put by a writer,—that as during all the progressive changes of life, the material of the animal body is ever new—"The poet's picture of the last stage of man's life, is not a true one. If man totters under the burthen of years, the simile of a *ruin* is inapplicable. The material of his frame is *not* different, and *not* older, than that of a child. Whilst the office of digestion and assimilation goes on at all—the material is ever decaying—ever RENEWING. The difference of the activity with which this change is wrought, compared with that of the child, may be as a week to a day: but here is not the cause of the grey hairs, the faded cheek, and the feeble step. The roundness and fulness of flesh, the smoothness, transparency and colour of the cheek, belong to *youth*, as *characteristic of the time of life*, not as a necessary quality of the material! It is designed that the *stages* of life shall be distinctly marked, so that the tenure by which we hold that life may be continually before us. These are the stamps which the Creator has intended should be deciphered and interpreted."†

* Dr. Ferguson's Introductory Address at King's College.

† Sir C. Bell's Bridgewater Treatise on the Hand.

Another, a minor, point, but still worthy of your notice, is, that in the living body, no such thing takes place as a wasting or weakening of the structure, by "tear and wear." On the contrary, unlike every mechanism constructed by human hands, in proportion as the body is kept in constant use, it actually *increases* in dimensions, and adds to its strength. Indeed, nothing contributes so certainly to the decay of the material, as stopping work. Exercise, said Mr. Hunter, of an organ, is its stimulus to perfection.

But what I principally wish to draw your attention to is, that it is by the continuance of the processes here described, that the body has the power of throwing off diseased and injured parts, and becoming repaired. As the material undergoes an incessant change, it is beautifully arranged, that structures damaged can be replaced by newly acquired matter, which assumes the forms of original health. Hence, by this revolution of the material, the body contains within itself the means of its own restoration; and nature, instead of having to establish a new mode of action for every casualty, heals all wounds, throws off all morbid parts, by a continuance of its usual operations. If a bone be fractured, the callus and newly formed osseous matter which knit the ends, are nothing more than tissues conveyed, by the natural operation of the processes adverted to, to the part which has received the injury. Thus you will understand what is meant by the—*vis medicatrix naturæ:* by its being said, truly, that the province of the medical man extends only to assisting and directing the usual operations of nature. "This property of the living body, to restore itself when deranged, or to heal itself when broken or torn, is an action which so frequently assumes the appearance of

reason—as if it were adapting itself to the particular occasion,—that Mr. John Hunter speaks of parts of the body as conscious of their imperfection, and acting from the stimulus of necessity, thus giving the properties of *mind* to the body, as the only explanation of phenomena so wonderful."*

Before quitting this subject, I am desirous of offering a remark, suggested by the phenomena which have been under our consideration—I refer to the alternate conversion of the animal tissues into blood, and of blood into the tissues. Where in nature can we look for similar wonderful processes? It is obvious, that in order to meet with actions and results of a like character, and thus obtain some grounds from analogy, on which to found a satisfactory theory in explanation of them, we must push our researches into other fields of science: that we must seek the aid of other collateral branches of knowledge. The processes bear most resemblance to chemical changes; and accordingly, the hopes of physiologists have been directed more sanguinely to the science of Chemistry, than to any other. Yet, as in vegetables similar phenomena are seen, *Botany* is another department of science which must be appealed to. Again, as we know that the changes occurring in vegetables, and those between inorganic substances in chemistry, are subject to laws of Electricity, of Magnetism, of Caloric, of Light,—and involve the most comprehensive and difficult questions proposed to philosophy,—we become convinced, at length, that for the enlightened investigation of such subjects in physiology, a man must have a mind richly stored with exact information derived from every great branch of natural knowledge. Unless his powers of observation,

* Animal Mechanics.

and reasoning faculties, have been exercised in similar researches, in different fields of study; and his mind has been accustomed to sound the depths of other sciences, so as to appreciate the grand comprehensive laws which govern the universe, the theories propounded by him will be contracted—fall short—and only obstruct the path of true enquiry.

I will risk fatiguing you by giving another example of the generalizations you will meet with, in pursuing this attractive study of physiology.

The vital processes which we have been considering, have a reference, it has been seen, to the *preservation* of the frame. But it may be asked, What is the great aim, or use, of that other part of the organization, which nature is thus so provident to preserve? It must obviously be of a higher nature than that of the organs ministering to it.

When we take a general view of the human frame, we perceive, united with the organs of digestion, assimilation, circulation, secretion, excretion, &c., another set of parts, which, whether considered as to their structure or actions, are quite different in character. We see a *body,*—with legs, arms, &c., obviously formed for spontaneous active power; and the whole is presided over by a *brain,* to which organs of sense, connecting it with the external world, are appended. For what high object are these parts provided?

That problem would not be difficult to solve, had we man's structure alone to account for. We should have said at once, that the organization was designed to provide a fit tenement for his MIND—to supply a system of organs which should bring his mind into community with the whole objects of creation, in order to develop

its faculties, and at the same time empower him to execute the works prompted by his reason.

But it is found, on looking to the structure of the Lower Animals, that they are formed on the same plan as man; and, in some animals, the organs approximate so closely to those of the human body, that they are nearly identical. In other words, creatures, placed immeasurably below man in point of psychical endowments, and which cannot correctly be said to possess what can be dignified with the name of a mind at all, still have an organization similar to man! That fact has appeared to some so inconsistent with the explanation referred to, as to be subversive of it; and arguments, founded upon it, have been brought forward by clever, but superficial men, to the effect of degrading the position of man in the animal kingdom.

The difficulty has arisen, from physiologists admitting too readily that man's organization is *not* superior to that of any of the brutes. The human body is planned, undoubtedly, on the same model as that of the inferior animals; resemblances are therefore met with, sometimes exceedingly close and striking, between the parts of each; but if those organs *which are especially subservient to the Mind,* be particularly studied, and contrasted with the analogous parts of the lower creatures, *there* manifest proofs will be obtained of the superiority of man's formation.

In pursuing this subject, it will be best approached, by enquiring, what organs are essentially requisite for the wants of every animal, high and low in the scale of animal existence. After settling that point, we shall be able to direct attention with better effect, to the structures which minister more particularly to the *mind* of man.

I will carry you at once to the lowest point in the

scale of animal life, and beg you to reflect, what is the grand distinction between a Vegetable and Animal being—What organs belong to an animal, which do not belong to a vegetable?

Vegetables and animals are not so distantly related to each other, as some, among my junior hearers, may perhaps be disposed to think. Indeed, some of the animals living in the confines between the two kingdoms, bear such a close resemblance to plants, and plants to animals, that zoologists frequently experience difficulties in deciding whose subjects they are. But if we take a general principle for our guidance, and disregard these approximations—(for nature in none of her works shows any delight in sudden, trenchant divisions—she never arranges the objects of Creation in squares, circles, or parallelograms; but proceeds, even in her progress from the inorganic to the organic world, by slow, uniform, gradations)—we shall find that the animal possesses organs, essentially distinct from the vegetable.

The organs *common* to the vegetable and animal—which establish a kindred tie between the flower-bearing plant and Man—and go so near to "make all *nature* kin"—are those to which our attention has been already directed; namely, the organs which provide for the nourishment, growth, and reproduction of the structure. Thus a plant imbibes nutritious matter from the earth—circulates that matter, as sap, along the branches and leaves; and it possesses besides organs, analogous to secreting glands, which eliminate various substances from the sap. It is not therefore to *those* parts, we can look, for the distinctive characters between vegetables and animals.

The difference will be found if we consider that the plant is *motionless:* that it is a fixture to the part of the

earth where it was originally planted. The vegetable is attached to the soil, and obtains its nourishment without moving for it—The animal, on the contrary, is *locomotive,* and must shift from spot to spot, in quest of nutriment.

Here, then, is the great and prominent distinction between a member of the vegetable and of the animal kingdom. The one is *stationary;* the other endowed with *spontaneous motion.* To ascertain, then, what are the characteristic, distinctive parts of an animal body, we have to enquire,—What additional organs must be supplied, to adapt it to *move* about, and *appropriate food* for itself.

The first set of organs which an animal will require, will be, organs of *Locomotion* or progression; in other words, parts analogous to our limbs. The second will be instruments which it may put forth, as we do our hands, to seize and secure the objects of nourishment—these are the *Prehensile* organs. The third, will be a *Mouth,* provided with appendages more or less resembling teeth, for dividing and triturating the food, and preparing it to pass along the gullet to the stomach. The fourth will be a set of organs entirely distinct in character from the former—structures endowed with the power of initiating motion, and regulating the actions of the combined machinery of the body—I refer to a *Nervous System:* analogous to our brain, nerves of motion, and organs of sense.

If we take a general survey of the Animal Kingdom we shall find that each distinct creature, whatever may be its place in the scale, possesses a representative, of one kind or another, of all the organs just enumerated. Their structure, it is true, is greatly varied, being accommodated to the different wants and habits of the

animals to which they belong; yet a single plan or type of formation is adhered to, even from the meanest floating thing that inhabits the sea, till we ascend to man.

Let me detain you by going rapidly over some of the more prominent points in the stages of development of these structures, when traced in the ascending scale, from the lowest to the highest of the animal series. For my present purpose, it is not required to include the nervous system: and I will therefore confine myself to the organs of *locomotion*—the *prehensile* instruments, and the *mouth*. The object of my going into the few details with which I shall trouble you, will presently be seen.

As was intimated before, the lowest animals, those placed at the very bottom of the scale, present in their organization, many of the characters peculiar to vegetables; accordingly, we are not unprepared to find some animals attached, like plants, to fixed points, and, therefore, not properly endowed with locomotive organs. These creatures, of which the Polypes—the Sea-Flowers—may be taken as examples, live in the water. Being fixed to rocks, they cannot transport themselves from place to place, in search of food; but yet they do not, like plants, imbibe their nourishment from the part from which they grow: the *mouth* in these animals is the principal organ; and around that orifice, tentacles are arranged, which are the earliest representations of *prehensile* instruments: the currents and undulations of the sea sweep the pendulous body of the animal from side to side, and to and fro, and thus compensate in some degree for the deficiency of *locomotive* organs: the tentacles and ciliary processes placed about the mouth, cause circles and eddies in the surrounding

water; and thus the nourishing matter held suspended in their neighbourhood, is attracted to their mouths and swallowed.

When we advance a little higher, we find animals, similar in general structure to the Polype; that is, provided with, a mouth, and with tentacles capable of directing nourishing particles into the mouth;—they also live in the sea: but instead of being fixed by moorings, they are let loose to float in the ocean. The creatures to which I refer are those resembling, more or less, the Sea-Nettle; in which it may be said that organs of progression exist; but they are in the very lowest stage of development. That animal consists of a mass of buoyant soft substance: by alternate contractions and expansions of its body, it has a slight power of directing its movements: but it trusts chiefly, for its change of feeding ground, to the effects of the tides and currents of the sea: like a boat without oars or rudder, it is drifted from sand-bank to sand-bank, and floating along passively, a prey to stronger creatures, and only defended by its stings, it picks up the food which casually falls within its reach. And here it may be observed, that it is in the ocean, lakes, or rivers, where we must look to find creatures, such as those I have noticed, that have their organs of progression, and of prehension, and mouths, in the lowest state of development: not only does the density of the water assist in buoying up their bodies, and make them independent of members to rest upon, but the fluid divides or dissolves the nutritious matters, so as to be more easily received into their mouths of simple structure.

Accordingly, when we advance higher in the animal kingdom, and arrive at those animals which possess the earliest distinct representations of legs for carrying

the body, we perceive that, owing to the imperfection of these members, the creatures partly inhabit the water, and partly the land: moreover, when they do visit the dry land, they crawl upon their bellies: that is, assist their legs by the tortuous motions of their trunks and tails: I allude here to Reptiles. Gradually, as the development proceeds, and an internal skeleton is bestowed, the body, having increased firmness and solidity, is well lifted up from the earth; and the legs become longer, more powerful, and more active: such is the condition of Quadrupeds.

Next, let me request you to observe the progressive advancement from the state of quadrupeds, to that of Man. As the fourfooted animals ascend in the scale, a contrast becomes evident between the power and dimensions of their *fore*, and their *hind* legs. Originally, both these sets of members participated equally in sustaining the weight of the trunk and head, and moving the body as organs of progression. But by degrees, the hind-legs increase in size and strength disproportionately to the others, and the fore-legs become possessed of freer and more diversified motion. In short, we see a preparation being made for the hind-legs becoming the exclusive organs of progression; and for the fore-legs taking on the part of arms, to act exclusively as instruments of prehension. But it is only in man, that this distinct appropriation of each part to its own particular function is found complete. The monkey, man's nearest relation, in the family of animals, can rest feebly and imperfectly upon the hind-legs—and he can skilfully grasp a cocoa-nut, with parts nearly resembling human hands:—but his so called hands, are still instruments of *progression*: they enable him to warp himself with agility along the branches of trees, his proper habitation. Man is dis-

tinguished above all other animals by his lower extremities having solidity and power sufficient to sustain his body, without the aid of other members, and so as to be his sole organs of progression. Hence, his erect position. Again, as man's upper extremities are emancipated from the duty of assisting in locomotion, they are free to execute whatever rapid and varied movements may be called for, either for self-defence or for procuring nourishment. And, in correspondence with that freedom of action, a *Hand* is added—which, for the perfection of its mechanism, and the admirable endowments it possesses, has been, in all ages, by all students and amateurs in physiology, from Galen to—the Earl of Bridgewater—a constant theme of admiration.

But let not our admiration of the "Hand," worthily bestowed as it is, prevent us from pursuing our inquiry further, into the indications of superiority of man's organization over that of the brutes. Allow me to ask, whether there be not connected with the *mouth*—one of the structures whose development we have been following—an organ, even higher in point of endowment than the hand—the organ of Voice, and Speech! What influence, then, have the improvements we have been tracing in the construction of the apparatus for progression and prehension upon the structure of the mouth, as adapting it for a Vocal organ—an organ of articulate Language?

To have a just view of all the bearings of this subject it is necessary to consider, that although, in man, the mouth fulfils the two great offices—first, of being a a Manducatory apparatus, for chewing and triturating the food; and secondly, one of the openings into the Lungs, and an important constituent of the organ of articulation—it is confined, in the great majority of

the lower animals—in all creatures below the Vertebrata, that is, at a guess, in about nine-tenths of the animal kingdom, to the former office alone,—namely, that of receiving the food within its cavity. With the function of Breathing, at least, the mouth has nothing whatever to do in all that extensive series of animals. It is not till we reach some of the higher Fishes that we have the earliest indications in the animal kingdom of that peculiar form of Respiratory organ which is carried to its highest point of development in man; and where a communication exists between a sac, in the interior of the body, distended with air, and called the lungs,—and the mouth. Previously to that stage of the animal series, the respiratory organ has had a *totally different form,* and has been limited in function to oxygenating the blood: now, we begin to perceive that important vital process performed by an apparatus, which is not only admirably adapted for the purpose, but superadds a power of producing sounds through the mouth—in other words, adds an organ of Voice and Speech to the organization.

It is in fishes, then, and in reptiles that we find the first signs of a Thorax, containing lungs, and of a tube, conducted from the lungs into the mouth, which eventually becomes a Trachea, with Larynx appended.

Before these various parts of the respiratory organ attain the perfect form which we see in man, or are properly adapted for being the instrument of voice and speech, they pass through numerous gradations of development. But without going further into that interesting subject at present, let us consider—What must be the modifications in the form of the *mouth,* when made one of the apertures in respiration, and a constituent of the organ of speech—in order to adapt it to

the formation of articulate sounds; in what respect must the mouth of man, differ from that of brutes, to enable the vocalized air, expelled through the larynx, to be so divided and modulated, as to produce words.

It is quite obvious that a mouth of a form or size, such as we see in the horse, or cow, lion, or dog, or, indeed any of the inferior animals, would not be suited for such purposes. The air could never continue its vibrations in such a long, intricate cavity; it could not be confined, and then be suddenly let free, to produce explosive sounds: it could not be made to impinge upon the roof of the mouth: or be directed into the nares: in short, none of those numerous, finely varied changes in the shape of the interior of the mouth, produced by the combined actions of the tongue, palate, cheek, lips, and which give rise to the infinite varieties of sounds in speech, could take place in such gross, clumsy structures. It is necessary that the cavity should be small, its boundaries regular and uninterrupted, the communication with the nostrils free; and that, on the whole, it should present the characters which we see in man, before it can be a fit instrument of articulation.

Now we must enquire, what is the meaning of the difference in the construction of the mouth in brute creatures, and in man: to what is it to be traced? It arises from this cause:—In all the animals inferior to man, besides being connected with respiration, the mouth plays two parts: it is not only a manducatory organ, but a *prehensile* organ! Besides chewing and triturating, the mouth has to seize and secure, the food; consequently it must be large and strong, and be provided with teeth, of a corresponding description.

What, again, causes the mouth to be employed, in these lower animals, as a prehensile instrument; what

subjects it to that necessity? The answer is direct. It is owing to the imperfectly developed condition of the organs of progression and prehension. It has already been seen, that the fore-legs in quadrupeds represent the proper prehensile organs: they are the parts analogous to the arms and hands of man: but in quadrupeds they are still used for progression: hence they cannot be applied to seize objects; and that office is consequently thrown on the *mouth*, which has to bite, rend, tear, and forcibly hold with the teeth, what it has afterwards to chew.

Very different is the case with man. Owing to his being provided with an arm and hand, free to execute all the objects of his will, he is under no necessity to use his mouth as the brute does. That organ being limited now to manducation, the jaws may be of small size, and comparatively weak: and the teeth may be set erect, and ranged in those uniform, regular rows, along the upper and lower maxillæ, which are so important for articulation. On the whole, from the mouth being absolved, by the perfection of the *hand*, from performing more offices than those of mastication simply, the cavity is diminished in size, the teeth and jaws reduced to moderate dimensions, and the whole form is suited in the most admirable manner for being the organ of articulate language.

These skulls of different races of mankind, with the busts, I have placed on the table to show—that in fashioning the mouth of man to adapt it to be a speaking organ, nature has not departed from her usual course of carrying on the process of development by slow and gradual steps. Observe what a contrast between this skull of the Negro and that of the European, caused by the inordinately large size of the jaws and

projection of the teeth in the former. Or turning to that cast, where the peculiarities of the head of the Negro are so admirably represented, look what a difference is produced, by the massiveness and coarseness of the mouth and lower part of the face generally, when compared with the small, refined mouth and jaws of the Apollo's head—in which all the characteristics of *human* structure, as opposed to brute, are so beautifully combined. But instead of going further into that subject, or attempting, as we might do were there time, to carry out the principle of the enquiry more fully, so as to explain our admiration of the Antique head;* let us return, for a few moments, to the Respiratory organ. Let us observe what changes gradually take place, during the progressive development of the mouth, in the mechanism of that part, to make the air contained in the lungs, primarily intended for oxygenating the blood, available also for Voice.

It is, first, to be noticed that in order to adapt the organ of respiration to speech, it is an essential condition that it shall be constructed in such a manner, that the air shall be expelled along the windpipe with a *strong impulse.* If that be not effected, the stream cannot be thrown into vibrations, or the sounds made sufficiently loud. Hence, besides provisions for admitting air freely into the lungs, it is necessary that the sides of the chest shall be in close contact, all round, with those organs; and that they shall be of such strength and firmness, that when they contract, they may compress the air in the lungs forcibly, so as to make the current issuing by the larynx and mouth rapid and powerful.

But what is the condition of the parietes of the chest

* See Sir Charles Bell's work on "Expression." 3rd Edition, 1844.

in the earliest stage of development of the organ of breathing, such as we find in the Sauroid fishes and lowest Reptiles? At first, the lungs are like mere bladders of air—they are long, delicate, membranous sacs; and instead of being confined in situation to one division of the trunk, or kept apart from the abdominal viscera, as in higher animals, they extend along nearly the whole length of the creature, and lie in a cavity common to them and the stomach, liver, &c.: and the walls surrounding them are so weak and flexible, that they can only contract upon them in a feeble, imperfect manner. By slow degrees, the membranous sac becomes more compact, and permeated by tubes communicating with cells, so that the structure approaches nearer to that of the human lung; and at the same time, a subdivision of the trunk into two cavities, a thorax and abdomen, begins to appear. But it is not till we have passed through the several classes of reptiles and Birds, that the division into two cavities actually takes place, and the lungs, with the heart, have an appropriate chamber assigned to them. That separation is effected by means of the Diaphragm, which, however important and vital a muscle it may be in man, (post cor, nobilissimus musculus diaphragma,) is not introduced into the animal series till we ascend to those creatures which have lips, and can suck—the Mammalia—the class next to Man. When the diaphragm is added, the lungs are surrounded on all sides by moveable walls, capable of expansion and contraction; so that by the act of inspiration, a large volume of air may be received into the chest, and part of that air be expelled, with whatever degree of force it may be necessary to employ, by expiration. In short, when the diaphragm is introduced, the organ of breathing attains

its highest state of *concentration* in the animal kingdom; and it is not only adapted in a perfect manner for oxygenating the blood, but, placed under the control of our will, is, in conjunction with the mouth, the admirable instrument of voice and speech.*

What, then, is the conclusion to which we are brought, from taking this extensive survey of the organs composing the animal body. Is it not, that in the great scheme of development through the animal kingdom, it has been the design, even from the beginning, to provide Man with a perfect organ of Speech? From the lowest to the highest animal, one plan or type of structure is seen to pervade living bodies: all, from the simplest to the most complex, have the same organs formed on one mould, yet varying wonderfully, by particular modifications adapted to habits and wants. As we trace these organs upwards, we invariably observe that, in

* For intercourse with his fellow-men, Man does not depend upon articulate language alone. There is the language of EXPRESSION—a mode of communication understood equally by mankind all over the globe;—not conventional, or confined to nations, like spoken language—but used by the infant before speech—by untutored savage visited by civilized European.

And it is admirable to perceive, that the same apparatus by which Voice is produced, is the one by which the passions and emotions are exhibited. It is one of the consequences of the concentration of the Respiratory organ in man, that the sympathies between it and the actions of the Heart are drawn closer, and are altogether of a more intense kind, than in animals where the mode of breathing is different; moreover, numerous complicated, associated actions, chiefly between parts in the face, neck, and chest, require to be introduced, to defend delicate structures, such as the brain, eye, &c., which are exposed to danger from irregularities in the *venous* circulation, necessarily attending the concentrated mode of respiration. Strong emotions of the mind, striking upon the cords of the heart, produce various troubled motions in the breast; these disturbed actions of the heart, are reflected on the extensive respiratory organ; and give rise to the varieties of Expression.

The subject bears directly on the argument in the text: but it is far too extensive to be treated of here. See Sir Charles Bell's work on "Expression." Third edition.

proportion as the animals rise in the scale, a nearer and nearer approach is made to the organization of man. Indications, at length, gradually appear of an organ adapted for articulate language. But in no animal, not even in those most approximate to him, is the structure properly suited to be an instrument of speech. It is reserved to Man to have that organ in its perfect condition—to have that plan, projected merely in the inferior classes, consummated and perfected.

I ask, does not this view of the development of the organ of Speech, convey a grand impression of the superiority of man's organization? of his high position in the scheme of Creation? Reflect on the purpose of the organ of articulate language. . . . It is to afford a fit instrument for the exercise and development of the MIND. And if the value of the endowment of an organ be taken as the sign of its superior rank—where, in the lower animals, can we find an organ with a function so elevated?

The inferior animals are moved by *Instinct*. . . . .And what is the grand distinction between mind and instinct?

It is this:—Instinct is *un*-cultivable: stationary:—useful for an animal confined to inhabit the earth:—admirably adapted to the wants of an *earthly* existence —"of the earth, earthy."

Mind is given for IMPROVEMENT. The evolution of *its* powers is the great design of the creation of man. It owns an extensive, almost an infinite, capacity for cultivation. It has aspirations, which make it soar above earthly enjoyments. Its final destiny is a FUTURE STATE.

Gentlemen, it may be thought by some, that in dwelling, at so much length, on these interesting topics, which belong to one department of medical study

alone, I have forgotten the plan and objects of an opening address. However, it has not been merely from yielding to the captivation of the subjects, that I have occupied your attention so long. It has appeared an imperative duty, to allow no opportunity to pass, of holding forth to view, in its correct light, the nature of the enquiries which engage the minds of medical men, even in pursuing the rudiments of their profession; and to show, to what exalted subjects of contemplation—leading to reverence, and inspiring the best feelings—they conduct us.

It is a subject of deep mortification to find, how greatly our studies are misunderstood—misrepresented. Hear the sentiments delivered in a work recently published. They are the opinions of—a clergyman—liberal, enlightened, charitable—energetic during his active life, in achieving great practical and comprehensive good—and leaving behind him, from the admirable and enviable character he made for himself, urgent inducements for others to follow in his career of usefulness—how gratifying, then, would it have been, had a different judgment been pronounced! Speaking of the choice of a profession, Dr. Arnold has these words:

"Medicine, in all its branches, I honour as the most beneficent of all professions; but there I dread an incidental evil—the intense moral and religious degradation of so many medical students; who are, if you may trust report, *materialist atheists*, of the greatest personal profligacy:—and then, if the profligacy wear out with age—the evil principle will not; and Satan will be but cast out by Satan."

. . . . . Atheists! . . . . . .

Is it possible that this educator of youth,—one, who from his position, must have been called on often, to give

advice, on their entrance into life, to young men destined for the profession of medicine, can ever have opened a work which discoursed on the science of Anatomy!

Let me turn to the testimony of another eminent, and no less liberal and enlightened member of the sacred profession—whose tastes, as evinced by his published works, draw him nearer to *our* profession; and it is hoped, make him a more competent judge on such subjects. Let us hear what Bishop Stanley has said of the aim and bent of our particular studies. The words I quote, were spoken on the occasion of the formal opening, last month, of the Norfolk Hospital Museum.

"It has been frequently said, and I have heard it in London, Edinburgh, and various parts, and from various quarters, that medical students, although engaged in this most interesting department of science, were less religious—nay, were more tinctured with infidelity, than any other class of society. I CANNOT AND WILL NOT BELIEVE THAT SUCH IS THE CASE. I will not believe that young men, applying their thoughts to subjects, in which Omnipotence, and Omniscience, are so deeply impressed in every branch, in every line, in every trace and path they pursue, can wantonly shut their eyes, cast aside their mental faculties, and deaden their sympathies, when approaching such lofty and enlightening subjects. If these *bony lips*," [pointing to the *jaws* of the skeleton] "could speak, what would they say? If those fleshless forms in yonder case, could address a sermon from the other world, they would tell of anything but infidelity—they would preach a discourse, which, for eloquence, they of this world could never reach."

FINIS.

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