

INTRODUCTORY LECTURE

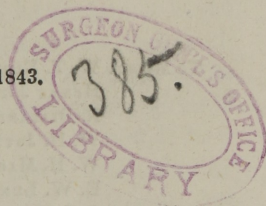
BEFORE

THE MEDICAL CLASS

OF THE

UNIVERSITY OF PENNSYLVANIA,

DELIVERED NOV. 9, 1843.



BY W. E. HORNER, M. D.,

PROFESSOR OF ANATOMY.

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CORRESPONDENCE.

PHILADELPHIA, Nov. 25, 1843.

To Professor W. E. HORNER.

DEAR SIR,—In behalf of the Medical Class of the University of Pennsylvania, we beg leave to tender you their sincere thanks for the very excellent and instructive address delivered before them on the 9th inst. ; and earnestly desire that you will increase our sense of obligation by complying with the united wishes of the Class in granting a copy of the same for publication.

With sentiments of the highest esteem and respect,

We remain yours, &c.

WILLIAM T. ELDRIDGE, of Va.

HENRY JOYNER, N. C.

RICHARD DILLARD, Va.

WILLIAM H. JOYNER, Florida.

WILLIAM H. MACKIE, Ky.

ETHELDRED W. LUNDY, Va.

JOHN C. HUGHES, Alab.

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1843
c.1

UNIVERSITY OF PENNSYLVANIA, Nov. 27, 1843.

To Messrs. W. T. ELDRIDGE,
HENRY JOYNER,
R. DILLARD,
W. H. JOYNER,
W. H. MACKIE,
E. W. LUNDY,
J. C. HUGHES.

GENTLEMEN,—Since my interview with you on Saturday, having had an opportunity of maturer reflection upon the contents of your letter of that date, I am still more sensible of the kindness of the Medical Class, in deeming my Introductory Lecture worthy of their publication. Whatever may be my own sense of its claim to such distinction, this is now waved in the desire of harmonizing with the declared wishes of yourselves and of your constituents, so politely expressed. A copy of the address alluded to will be accordingly at your disposal.

Very truly,

W. E. HORNER.

INTRODUCTORY.

To study the organization of a being, whose destinies, according to the declaration of Omnipotence, have called him to the headship of animal life—to whom it has been conceded to have dominion over the whole offspring of the earth—the inhabitants of the waters—and the flitting tenants of the air,—to inquire, I repeat, into the structure of such an existence as man, is to engage in a course of philosophy of remarkable extent, beauty, and interest. No department of science can exceed in its limits one which teaches us, how man, inferior in muscular power to the elephant and to the leviathan of the deep, makes of the one an obedient instrument of his will, and in meeting the other upon his own element, in the midst of the trackless ocean, offers combat, and terminates it in the destruction and spoliation of his antagonist;—how man, with an eye, or vision, less penetrating than that of the eagle or the grayhound, yet scans with his glance the boundless regions of space, and detects the existence of new worlds, and of new systems of worlds;—how, he, with a touch incomparably inferior to that of the antennæ or feelers of insects, yet elaborates a tissue of the tenuity of the finest and most filmy gossamer;—how, that with senses of smelling and of tasting dull and almost paralyzed when compared with those of other animals, he yet traces his prey with a certainty almost equally unerring; and is also admonished, in a manner not to be mistaken, of those productions of the earth which, when introduced into the system, poison the fountains of life, and annihilate its every function.

The above category has its explanation in the fact that the physical faculties of man, though they have, in regard to any single function, a state much inferior to the corresponding faculty of animals, are yet in a condition of harmony with

each other, of proportionate development not to be found in any other part of the creation. In common animals one faculty is most usually paramount; the chief offices of the animal are executed by it, and all other offices are in a state of subordination, or of extreme debility. It is sometimes the vision which transcends—now the smell—then the touch; in a fourth instance, great speed, as in the horse: but there the attribute ceases. In man, on the contrary, the sight, the hearing, the smell, the taste, the touch, the mechanism and the motion of the limbs all combine, in just proportions, to produce the greatest dynamic result. We look with admiration upon such mechanism in examining its wonderful adjustment to exterior objects; but we are lost in the contemplation, when, to this mechanism, is added, for its direction, man's intelligence—an intelligence only inferior to that of disembodied spirits. The foregoing picture may be viewed as the personification of but one individual of the human family; and superior, is it to the condition of any other individual specimen of animal life; but man widens the space immeasurably, by his power of combining with other men. The perfection of each individual thus becomes, as it were, common property. From the acumen of one who has the sense of sight most correct and discriminating, society at large gains all that may be obtained in the way of vision; from the experience of preceding generations, society obtains the lessons of wisdom; from the intellectual supremacy of a single member, it derives the knowledge of nature and a perfect social organization. In fine, man presents himself on earth with all the advantages to be derived from physical faculties in a state of exact harmony—from an unequalled intellectual endowment—from the experience of ages to warn and direct him—and from a power of combination with his fellows, whose every variety of talent and of perfection is elaborated into one harmonious action. It is thus that we trace, in faint and imperfect outline, the cause of man's supremacy on earth, and infer that the study of him is extensive, is beautiful, and of unsurpassed interest. To the department of Physiology be-

longs the duty of filling up this picture of functions, of expounding their details and proximate causes, of declaring by what application of physical laws the eye is a perfect optical instrument—the ear a perfect acoustic one—the hand a perfect mechanical apparatus for prehension and manipulation. And to the metaphysician may be left the analysis and exposition of those mental properties which, whether they consist in a plurality of faculties, or are merely the exercise of one, place man at the head of intellectual animals.

With operations of body and of mind so complicated by this dependence on each other, and with such exalted destinies in view, it is not at all astonishing that nature has imposed upon man so long a course of education before he can be fit for the proper and judicious exercise of his powers. Of all animals he is the most helpless at birth, and for some time afterwards. The new born infant is the most sensitive and nervous creature in existence; his first intonations are cries of distress at the coldness and harshness of the atmosphere into which he is ushered; instead of a medium, as formerly, of nearly the same specific gravity with his own body, and affording it an easy and uniform support, his person is restrained by dress and reposed upon an unequally pressing surface. His eyes only semi-transparent, receive confusedly the rays of light—his ears are closed with mucosity. His head large, soft, imperfectly ossified and too weighty for its means of support, lolls about according to its inert gravitation to one side or another; his limbs, short and feeble, are left to chance for their direction, and are incapable of just and appropriate application. His nourishment can only be of the blandest kind or taken from the bosom of the mother.

Helpless, puling, and pitiable as infancy is, yet man in the ordering of Providence, is indebted to these very conditions for the perfection of his manhood, and for the high destiny which the latter enjoys. The extreme softness of the constitution in early life, makes infancy more subject to the restraints of training and instruction. Its numerous wants excite constantly the parent's solicitude and attention. Instinctively

directed in the progress of life to make itself acquainted with all the objects around it, by the application of its senses, by its seeing, its hearing, its smell, taste, and touch—in a word by that mental action called curiosity, the sensations and ideas would multiply entirely too fast for correct judgment were the curtain of knowledge lifted up at once.

To extend, however, such considerations much further would be to trespass upon a department of the school most justly distinguished by the talents of its Professor, and by the eagerness and enthusiasm with which his instructions are received. I shall, therefore, proceed to my more appropriate duty of pointing out the intentions of Anatomy as a practical and applicable science.

In this view Anatomy has been divided into Medical, Picturesque and Comparative.

The first of the preceding, Medical Anatomy, occupies the highest ground in point of utility, and is the special object of our own inquiries. Through it we learn the whole of the apparatus of the human body, its bones, its muscles, its ligaments, its various organs for self conservation, and for the propagation of the species; its organs of relation, as the brain and the senses; in fine, all of its parts, in all stages of life, and in both health and disease. A branch involving such an immense multitude of objects must of course require much application for its acquirement, and no small diligence in repairing the damage and loss from the ordinary frailty of memory. The principle of the division of labour so common in the arts, has therefore been introduced here with some advantage. The surgeon limits himself to such points of anatomy as are most concerned in operations, and studies well the relative position of their constituents, and this he calls Surgical Anatomy; the general practitioner goes beyond this point, and studies also the organization and shape of parts too deep and complexly connected to be cut, but yet the subject of disease, and this he calls Special Anatomy, the objects of which involve all those of surgical anatomy, as well as its own. Then there is a General Anatomy, or His-

tology, which paying less regard to mere details of shape and position, is occupied with the elementary tissues of which the whole body consists, and teaches the proportions and number of them composing each organ.

Thus far anatomy presents itself to us in a sound state of the human frame, but as no part of the latter is exempt from diseased changes of structure, and as those changes are numerous, and many of them obscure, besides being very important, some men have attached themselves almost exclusively to the study and representation of such changes, and have given to their labours the name of Pathological Anatomy. It is clear, however, that a man to be a good pathological anatomist must be perfect in his special and general anatomy, as they are to him the standards of health and of truth, in all departures from a normal condition.

2d. Picturesque Anatomy, belongs properly to the arts of painting and sculpture, and being occupied with the mere exterior of shape and its mutations, its range may be considered as the portal to the temple. It has, of course, its appropriate attractions; by it are indicated the variations of the body, arising from increased or diminished corpulence—from a difference of sexes, of ages, of organic proportions, and from the influence of passions, of affections, and of habits of life. An accurate knowledge of it is indispensable, where great attainments in the fine arts are the objects of pursuit. In studying the enchanting specimens of skill which the genius of painting and of sculpture has produced, it is evident that their masters have had the most perfect attainments in picturesque anatomy. The phrenologist, the physiognomist, and even the common observer of human nature, all avail themselves of its indications; and the physician makes it tributary to his own art in determining, from the expansion or collapse of the countenance of his patient, whether the progress of disease is arrested or not: he also knows that though there may be no painful point in the organism, no function much impaired, yet a steady advance of emaciation must arise from some latent derangement of structure leading to death. From the

nature of this study, language is inadequate to express the gradations and modifications of exterior form to which it is applied ; therefore, each one must be chiefly his own teacher, and by the habit of observation obtain the degree of skill known under the name of tact—the happy and expressive attribute of genius and of application.

3d. Zoological, or Comparative Anatomy, meaning that of animals generally, might, if it were expedient, undergo the same subdivision with the anatomy of man ; this, in fact, has been done in the case of some of the more useful animals, as the horse and ox : but, in a vast majority of them, it is thought to be keeping knowledge within its fair boundaries to confine our examinations to their healthy shape and structure. Comparative anatomy is eminently scientific and philosophical ; it engages the mind by the variety of its objects, and enables us occasionally, by the analogies it presents, to determine the more abstruse points of structure in the human body. Less subservient, however, to the wants and comfort of mankind than the other departments of anatomy, its cultivation has been given up, perhaps rather too much, to the naturalist. As a branch of science, it enables us to classify or group animals according to their internal structure and organization—to judge of the nature of a strange animal by its resemblance to such as are known—to predict its usefulness or its noxious habits, and consequently to prepare for its propagation or destruction. It is applicable to every form of animal life, from the most simple and degraded to the most complex and elevated. Both comprehensive and minute in its researches, and abounding in physiological induction, there is no science more deserving of the name of transcendent, which has been applied to it.

Among the most prominent of the applications of comparative anatomy, is that of seeing the dependance of the habits of animals upon some point of their mechanical conformation. Thus, considering man himself as at the head of the list of animals, we recognize in his configuration, which alone is fully suited to the erect attitude, the supremacy and superin-

tendence which he has over all other animals, and also his fitness to survey the works of creation belonging to earth, as well as those of the firmament. It is very evident, from the shape of his bones, as well as from the planes of their articular surfaces, that he never was an animal, according to the hypothesis of Lord Monboddo, whose natural posture was that of the quadruped, and from which he was slowly raised by the process of education; on the contrary, we have every reason to believe that from the beginning he stood erect after the period of infancy—an opinion well expressed by the Roman orator: “*Deus homines, humo excitatos, celsos et erectos constituit.*” We also see in him, as in other animals whose bones have to bear much weight, that they are hollow cylinders, for the purpose of obtaining, upon common mechanical principles, the greatest strength from the smallest quantity of material that can be applied to that end. Birds have this principle of structure even more developed, to qualify them for flight in the air, with the least opposing weight; and their feathers or plumage, besides its hollow barrels, is placed in a direction affording the least obstruction to their progress. Birds, moreover, possess a power of self-inflation, by means of a communication between their lungs and the hollow of their bones, whereby their specific gravity is diminished. Fish, by means of an air bladder, which they enlarge or contract at pleasure, can determine with ease the plane of water on which they swim; such, however, as are naturally destitute of it, keep themselves at the surface only by the more laborious exertion of the fins and tail; hence they prefer lying at the bottom.

Atmospheric pressure, we know, exercises, when favourably applied, an influence of fifteen pounds on every square inch of base. Every one, who has had the air beneath his hand exhausted by an air pump, must remember the great weight thus thrown upon it; he must also know the effect of drawing back the piston of a tight syringe when the pipe is closed: a vacuum is thus created within, which disposes the weight of the atmosphere upon the piston. Now, many ani-

* Cicero, Nat. Dom. ii. 56.

imals have the faculty of walking upon perfectly polished vertical surfaces, and of adhering to them at pleasure, in consequence of their having broad membranous feet, which they can apply in such a way as to exhaust the air beneath them, and thereby sustain themselves by atmospheric pressure. Such is the case with the fly, the butterfly, and the lizard, all of which can go on the wall or ceiling as well as on the floor. Some of the larger sea animals can, by this mechanism, ascend the vertical sides of floating mountains of ice.

Illustrations of aptitude of structure to some peculiarity in the habits of an animal are innumerable, but I may be excused from pursuing this topic after a few more instances. The camel can traverse with ease those extensive sandy deserts of Africa, where the footing is so loose that it is displaced and yields several inches at every step of man or other animal; this it accomplishes by means of a broad spreading, elastic hoof, of a peculiar shape, which affords a large base; it has also a large cavity in its body, a sort of additional stomach, where water will remain for many days unchanged, and to be used at the pleasure of the animal; a provision without which it would be impossible for it to cross those deserts of several days journey, where no water is to be found.

The rein deer, the inhabitant of snowy countries, and accustomed to a footing still more insecure than the camel, has also a broad spreading cleft hoof which affords a suitable base, and the under side is covered entirely with hair of a warm close texture to protect it from cold.

It is said that by a train of very profound mathematical reasoning, we may arrive at a knowledge of that curve which, by revolving on its own axis, makes a solid of the least resistance, or in other words a solid which will move most easily through air, water, or any other fluid. Now, by comparison it is found that the heads of some fish bear a very close analogy with that solid, so as to suit them to swimming rapidly.

The habits of animals are not less worthy of notice, and

not less instructive than their conformation; many of their actions seem to be the result of instinctive mathematical principles. For example, it is known that the curve called a cycloid, and which is traced by a point of a circle moving forward by a revolution on its own axis, as a nail in the tire of a carriage wheel, is that line in which a projected body will move with the greatest velocity between two points. It has been remarked by naturalists, that the descending flight of the eagle is actually or nearly in this line, which of course gives it great advantages in securing its prey.

If it be expedient to fill up any space exactly with a number of distinct pieces of the same size, they must either be cubes or figures of three equal sides, or of six equal sides. Without this regulation, space is unavoidably lost. The six-sided figure has some advantage over the other two on the score of strength and the accommodation of cylindrical bodies within it. Now, it has been observed with admiration by philosophers, that the honey bees, so economical and so prudent in other things, resort to the exact hexagonal shape for the construction of the cells of their comb, in other words, they adopt that plan which is most sparing of space and material. The tops and bottoms of their cells are also constructed of three planes meeting at a point, and with an angle, which upon a calculation of the ablest mathematicians, is found to combine the most suitable strength with economy of wax.

The same animal, by an instinct equally unsearchable, economises even the process of gestation; it is known that a swarm has but one breeder, who, from the homage paid to her, is called the queen. This individual, having to gestate for the whole colony, has an abdomen so enormous that motion is to her extremely difficult, and she therefore remains at home; this arrangement, however, has the advantage that there is but one idle person in the whole nation, all the others being employed in gathering provisions, building cells, keeping watch, and feeding the young. But what is still

more remarkable, if the queen should die, as she is not hatched more than any other with this prolific quality, they instal a young grub of their choice in the royal apartment, and by a process of feeding and attention, metamorphose it into a queen, having all the fecundity of her predecessor.

The ant has in many respects the habits of the bee, and the colony is kept up by the fecundity also of one individual, the amplification of whose abdomen, from the immense multitude of eggs it contains, is almost incredible; in such as are not naturally more than half an inch, or three-fourths long, the abdomen becomes as large as a finger. In some countries these insects are, from their numbers and ferocity, among the most formidable intruders upon the settlements of man; this is especially the case along the western shore of Africa, and in some parts of South America, where their hills are said to be fifteen or twenty feet high with a base of thirty.

Having presented, Gentlemen, the preceding summary of the application and extent of Anatomy, when cultivated upon the most scientific and philosophical grounds, it is evident that so large a field must require many labourers, each of whom ought to have an allotted and circumscribed task, to enable him to perfect his work, for even if the same mind could comprehend and retain all these things, the brevity of human life would prevent its application to them. I have been induced to give this sketch because there may be among you persons who pursue medicine as a liberal rather than a professional study, and by pointing out some of its numerous paths which lead to the highest grade of intellectual acquirement, I may possibly apply the first spark to the enthusiasm of an American Cuvier, or a Bichat. At any rate, I hope there is no one so phlegmatic or calculating as to ask *cui bono?* for what purpose is all this,—how can all such refinement and extension of knowledge improve the condition of any one? If there be such, I would answer, that there is a description of knowledge which, though it cannot be valued by a pecuniary standard, is yet most con-

ducive to the happiness of its possessor; the stomach may cease its functions of easy digestion, and the limbs may totter from feebleness, so as to disqualify from motion, but the mind may still draw with pleasure from those eternal and unfathomable fountains of knowledge flowing on every side, from the bosom of nature. To pass our time in the study of the sciences, and in enlarging the boundaries of learning, has always been considered the most happy and the most dignified of human occupations.

Proposing, as I do, to give next a short sketch of the means by which human anatomy has reached its present elevation and perfection, I shall not occupy time in canvassing the knowledge of the ancients on this subject. There is strong evidence of its having been an object of their studies; for one may find in their writings the rudiments of many ideas now more perfectly evolved. There is, however, no proof of any great advancement, for the most liberal construction of their allusions and descriptions, leaves so much deficient, that all their writings put together and studied only by themselves, would leave anatomy a chaos. We can scarcely attribute this deficiency to the loss of books in their descent to us, because such of their fragments as have been saved would bear the indelible marks of a more perfect whole; it would be easy to tell that a column itself was a finished piece of composition and work, if a fragment of it exhibited signs of perfection; but no one can establish this for the anatomy of antiquity. This imperfection of anatomical knowledge is the more remarkable because the best models of many other objects of human learning, are to be found at that period: as poetry, history, narrative, eloquence, architecture, painting, sculpture, and perhaps of civil government. We may also say that at no subsequent period have the faculties of the human mind been so vigorously exercised, or its near approach to a communion with its divine original been so clearly exhibited; and yet what is most remarkable, among all the efforts of their genius and

of their inspiration, there is no model of Anatomy to be found among the ancients. When I reflect upon this solecism in the history of the human mind, for solecism it is, it appears to be almost impossible to explain it, except by supposing that anatomical knowledge, though possessed had not been committed to writing, but perished with its owners. Considered as a science of pure observation, and requiring generations to mature it, there were yet other sciences matured under the same difficulties and conditions. Again, if we alledge popular prejudice and horror at a dissection, there were yet princes of magnanimous dispositions, and philosophers to profit by them; to say nothing of the innumerable opportunities from public executions and from battles, where no sympathy would be excited by any treatment whatever of a dead body. Conjecture is, in fact, lost in the variety of its surmises, and in the objections which may be brought against them; we can only wonder at the actual state of Anatomy at former periods, if we are to consider what has reached us as a fair specimen of it.

Towards the end of the thirteenth century, learning began to revive in Europe after it had been almost extinguished there for several centuries, and whatever of ancient writings had been preserved in Constantinople and in Bagdad were brought back into Italy with the Greek and Latin languages. With this renovation, Anatomy took a start; as surgery was forbidden by an edict of the Emperor Frederick II. to be practised, except by those conversant in human dissection. The latter procedure seems to have been for the time very limited, for Mundinus, a physician of Milan, having dissected three bodies, one in 1306 and two in 1315, he made those dissections the basis of a work on Anatomy, which for a long time was considered as the best authority by the physicians and surgeons of Italy. These were the first dissections since the period of Herophilus and Erasistratus, a space of fifteen or more centuries, which were performed in a regular authorized manner. In 1376 the physicians of Montpelier got a special permit from the Duke of Anjou to dissect annually the body of one of the criminals executed.

Gui de Chauliac, who wrote a treatise on surgery about that period, gives us some notion of the manner in which anatomy was taught. He says that Bartholomy, a physician and monk of great learning, made four lessons of it; in one he showed the contents of the abdomen, in another those of the thorax, in a third the brain, and in the fourth was a demonstration of the superior and of the inferior extremities. Anatomy was taught in Paris for the first time in 1494, and at a period so late as 1556, the celebrated Charles V. of Spain, submitted to the Theologians of the University of Salamanca, the question whether dissections were proper.

As it is not my intention to follow, in exact chronological order, the different anatomists as they appeared on the restoration of learning to Europe, I shall confine myself to the most prominent. Among them, the name of Andrew Vesalius is singularly conspicuous, for he may be considered as one of the most extraordinary. Born in affluence at Brussels, about 1515, he early in life gave indications of unusual abilities. Before the age of twenty, he had read the works of Galen and of Avicenna in the Arabic; he spoke the Greek language with fluency, and was supposed to be better acquainted with the Latin than any of his cotemporaries. No obstacles could suppress his zeal in anatomy, and no dangers deter him from the prosecution of it. At the age of twenty-nine, he published a system of Anatomy, which in copiousness and accuracy was unrivalled; in this he takes great liberties with Galen, by exposing his errors freely, and by showing that many of his descriptions are made from the bodies of monkies. In an age when the reputation of Galen was at the most elevated point, it may be supposed that so daring an accusation excited many enemies; he was accordingly treated with the utmost acrimony by Sylvius at Paris, Eustachius at Rome, and Fallopius at Pisa. He had, however, the satisfaction of a complete triumph, and of being placed in the highest station of royal patronage as physician to Charles V. The controversies which existed at this time were of singular service to Anatomy, it being, from the great vigilance of its cultiva-

tors, impossible to palm anything upon them which had not legitimate claims to attention. The human body was, therefore, examined with the greatest care, and nearly all the parts of it described with minuteness and accuracy. It is certain that the observations of the sixteenth century included most of the leading points of Descriptive Anatomy. Vesalius, on being transferred to the Court of Spain, practised his art with the greatest reputation and success; but there an accident befel him which ultimately caused his premature death. Having lost a patient, a nobleman, he obtained leave to examine the body: but, to his great dismay, on opening the thorax, the heart was found still palpitating. The relations of the deceased instituted a prosecution, which compelled him to fly. As an atonement for the transaction, he undertook a pilgrimage to Palestine, and spent several years there, but was at length recalled to fill the place of Fallopius, who had died during his absence. On his return, being shipwrecked on the Island of Zante, he there perished with hunger, in the fiftieth year of his age.

The seventeenth century was signalized in the discovery of the circulation of the blood by Harvey. His merit on this occasion may be better estimated by a short review of what his predecessors had done. In 1547, Sylvius, of Paris, had demonstrated the valves in the vena azygos, in the jugular, the brachial, and the crural veins; and their existence was quickly verified by several of his learned cotemporaries. In 1574, Fabricius ab Aqua-pendente, of Padua, and the instructor of Harvey, satisfied himself of the same thing, without a knowledge of the preceding observations of Sylvius, and had several plates with descriptions made in 1603. The valves of the heart were known at a period long antecedent, and some idea existed of its office. Galen says, this organ, the heart, is a kind of reservoir, which attracts the blood by one opening and sends it off by another. The arteries are distributed over the whole body, and are filled with blood every time the heart contracts; they then swell out, and mark their dilatation by strong pulsations. Galen also

taught the anastomosis of the arteries and veins, for he says, if you kill an animal by opening several large arteries, you will find both arteries and veins empty, which surely would never occur if there were not open communications between them. He also says, that over the whole surface of the body there is a mutual anastomosis, and opening of the mouths of the arteries and veins together, and they take from one another the blood by certain invisible passages.*

Servetus, a physician and theologian of Arragon, who was treacherously seized upon in a journey through Geneva, and burnt there, at the age of forty-four, as a heretic against the doctrines of Calvin, and through his influence: taught in 1553, that it is impossible for the blood, according to the received notions of the time, to get through the septum of the ventricles, in order to pass from the right to the left side of the heart, but that it flows through the pulmonary artery, which is minutely ramified in the lungs, into the extreme branches of the pulmonary veins, and from thence into the left ventricle, and through the aorta into the whole system. This important theory of Servetus made but little impression at the time, and was concealed amidst a pile of errors in anatomy, and of discussions in theology.

Columbus adduced the same reasoning with regard to the pulmonary circulation, and the impossibility of the blood getting through the septum of the ventricles.

Cæsalpinus, physician to Pope Clement VIII, adopted the ideas of Servetus and Columbus, and in addition to them says a very singular phenomenon is observed in the veins, it is that when a ligature is applied to the arm, the veins swell below and not above it: now if the blood comes from the heart through the veins, the contrary of that ought to occur—the veins should swell above the ligature. But the truth is, the vessels of the heart are so disposed, that the blood flowing through the vena cava, is carried into the right ventricle, from that through the lungs into the left ventricle, and from thence into the aorta. The mistake which prevented

*Coxe's Inquiry, p. 36.

Cæsalpinus from giving a full and perfect account of the circulation, was the belief that the veins brought the blood back only by night.

These doctrines were almost forgotten when the work of Harvey, entitled *Exercitatio Anatomica de motu Cordis et Sanguinis in Animalibus*, was published in 1628. In this it is expressly declared that the blood is distributed from the heart to all parts of the body through the arteries, and returns through the veins. The leading argument is that as the heart wastes its blood at each contraction of its ventricles, a necessity existed for a constant supply from some source or other. This source was to be found only in the veins, which all emptied themselves by two large trunks into the right auricle, the valves forbidding a current except towards the heart. The blood of the veins would also be quickly exhausted without a supply for them, as they disgorged themselves incessantly. This source of blood necessarily exists in the arteries, they alone carry it into the veins, there being no other canals to conduct it there. But it has already been seen that the heart throws its blood into the arteries, therefore there is a continued round of circulation from the veins to the heart, from the heart to the arteries, and from the arteries to the veins, and so on successively during life.

A discovery of such importance, and so pregnant with results, attracted the attention of the whole medical world. Such as were jealous of the reputation attached to it, and were not able to deny its truth, affected to find, in the writings of Hippocrates, of Galen, of Plato, and others of the ancients, an allusion to it. Others attributed it to Sylvius, Columbus, Servetus, alledging that the amount of Harvey's observations had been to put into a compact system the knowledge of his predecessors.

It may be sufficient for me to say that a brief review of the several stages of our present knowledge amounts to this: that Galen had taught the general anastomosis of the arteries and of the veins—Sylvius had discovered the valves of the veins—Servetus had taught the pulmonary circulation—

Cæsalpinus had laid down the course of the blood at every step except that from the ends of the aortic into the venous system, and nothing remained but for him to adopt Galen's idea of a general anastomosis and the circle would have been complete. Harvey had, however, the genius to view the subject in its entire bearing, and to him has been awarded the great honour of the discovery. This point has been conceded by some of the best scholars of Europe, at various times, among whom we may mention Senac,* Morgagni,† and Portal.‡ But the latter, a great admirer of Harvey, reproaches him§ for passing over in silence the names of Anatomists who had a glimpse of the circulation, and considers that he had tarnished his reputation by not citing his predecessors, Servetus, Columbus, Le Vasseur, and Cæsalpinus. Le Vasseur is thought by Portal to have known the valves of the heart and their uses, and Cæsalpinus to have known the anastomosis of the arteries with the veins, and the consequent transmission of blood by them. There can be little doubt, upon the whole, that Harvey's jealousy of his discovery tempted him to take a very uncandid course, and to monopolize where he ought rather to have been a participant. His studies in Italy under so learned a teacher as Fabricius ab Aqua-pendente, must, in all probability, have made him acquainted with facts, of which he takes no cognizance in his writings.

The same period was likewise rendered memorable by the discovery of a system of vessels, whose existence till then was unsuspected. Gaspard Asellius, Professor of Anatomy in Pavia, while engaged in some experiments upon the diaphragm of a dog, remarked upon the mesentery several small linear vessels, containing a milky fluid, which after a while

* *Traité de la Structure du Cœur.* Paris, 1749.

† *Præfat. ad lib. de morb. sed.* "Incomparabilis naturæ Mysta Gulielmus Harveius, Angliæ immortale decus, haud ulli veterum virtute secundus." Venet, 1761.

‡ *Histoire de l'anatomie,* Vol. II. p. 467. Paris, 1770.

§ Page 474.

disappeared to his great perplexity. On opening a second dog he failed to find them. He then remembered that the first dog had been fed a few hours before the observation. Upon repeating this precaution on a third dog, he had the happiness of seeing the restoration of his vessels; and having instituted upon this basis a series of experiments, he had the good fortune to prove the uniform existence of the lacteal vessels, or those which convey the nutritious part of the aliment into the general circulation. He, in fact, revived an observation of Herophilus and Erasistratus, made about two hundred and eighty years before the Christian era, and which had fallen into discredit through the instrumentality of Galen, who disbelieved it.

It is remarkable that Harvey, who complained so loudly of the opposition to his own discovery of the circulation of the blood, should have lived for thirty years after that of Asellius without acknowledging it, and finally died protesting against it.

In 1647 Bartholine and Pecquet corrected an error of Asellius in regard to the course and termination of the lacteals, and, with Van Horne, proved that they went into the thoracic duct which had just been discovered by Pecquet. In 1650 the lymphatic vessels were discovered by Rudbeck, and were the next year found by him in all the regions of the body.

While these fundamental changes were occurring in Anatomy, by the discovery of new organs and modes of actions, great improvements were made in the knowledge of minute structure, by the use of the microscope, at that time a new instrument; and by minute injections. Italy, always fertile in works of genius, and ardent in the cultivation of Anatomy, had a new lustre reflected on her by Marcellus Malpighi, designated at that period as the "eye of Italy and the phœnix of anatomists, *Ocellus Italiæ et veluti Anatomicorum phœnix*.* At the age of thirty, or rather twenty-seven, (1655) he had already made a brilliant reputation, and the schools of Bologna, Pisa, and Messina had

* Portal, Hist. Vol. iii. p. 114.

successively enjoyed his valuable services. He was patronized by Ferdinard II, Grand Duke of Tuscany, and also by Innocent XII, in whose service as first physician, he died at Rome of apoplexy, in 1691, aged 67 years. On the dissection of his body by Baglivi, besides other derangements of structure, two pounds of clotted blood were found in the right ventricle of his brain. It is to him that anatomy is indebted for the knowledge, of the vesicular structure of the lungs, of the papillary structure of the tongue and of the skin, of the acini of the liver, of the lobulated and vascular structure of the kidney, and, in fact, of numerous points of minute anatomy, which having become by time and usage the common doctrines of the profession, but few persons know or take the time to inquire their origin.

Cotemporary with Malpighi, but younger by ten years, was the equally celebrated Ruysch, who was born at the Hague in Holland, in 1638. At the age of twenty-seven he became Professor of Anatomy at Amsterdam, and afterwards exhibited such rare talents, that all Europe rang with his fame. He is considered to have perfected the art of minute injection, and of the preservation of dead bodies. His eulogist, Fontanelle, says that after a long life, he had the pleasure of seeing that none of his preparations were spoiled by time, and that no term could be fixed to their duration. His dead bodies retained their plumpness, their flexibility and so much of the tints and expression of life, that they looked rather like persons asleep. The sensation was universal at such unprecedented success; Generals, Ambassadors, Princes, and Kings came to witness it. Among the latter was the Czar Peter the Great, who on his arrival in Holland, in 1698, hastened to visit Ruysch's Museum, and was transported with admiration at the sight. History states that he kissed tenderly the body of a little child whose features had been preserved in all their loveliness, and who appeared to smile at him. To enjoy such a spectacle more at leisure he frequently ate at Ruysch's. He finally, on his second visit to Holland in 1717, purchased this cabinet and

sent it to St. Petersburg. Ruysch immediately set to work in forming another, and laboured closely upon it, though he was then in his eightieth year. Like the favoured servant of Jehovah, even at this age, his eye was not dim, nor was his natural force abated.* By industry he, in a short time, formed as fine a museum as the one he had sold. In his ninetieth year he broke his thigh by a fall; the vigor of his constitution soon reestablished him, with only the defect of a halt in his gait, and he resumed his post in his museum, which he continued to exhibit to the curious until his death, which occurred in 1731, being upwards of ninety-two years old. His greatest pleasure was in instructing young people, and one of his daughters he had made an excellent anatomist and botanist. Ruysch having carried his researches into every part of Anatomy, was the original observer of a great many things, besides correcting the errors of his predecessors and cotemporaries. The latter involved him in many sharp controversies, in which the parties had no restraint of language. Among the complimentary epithets of the time, Bidloo, of Leyden, called Ruysch a smart butcher, (*lanio subtilis*;) and in return was called a famous pimp, (*leno famosus*.) Bidloo having exposed himself by certain irregularities to this sarcasm, and moreover by a height of passion which induced him to say that Ruysch was the most inferior of all Anatomists. To particularize the labours of this great man would be to engage in discussions too long and too numerous for the present occasion. It may be sufficient to say that the impress of his genius, like that of Malpighi, is felt every where, and the knowledge imparted by him has become common property by the universality of its reception, while the source of it is to many unknown.

The seventeenth century presents many other names of distinction, which I pass over; it was indeed the Augustan age of Anatomy, for never was a science illustrated by men of greater zeal, greater industry, or greater talent. Harvey, Asellius, Malpighi, Borelli, Ruysch, are the classical

*Deut. xxiv. 7.

authorities of our profession, where we may look for the precious treasures of thought, of invention and of discovery.

The eighteenth century was also distinguished by the great men who flourished in anatomy, and were known by observations more or less in a particular line. To avoid repetition we pass over Ruysch, whose labours extended over the first third of it. Albinus gave the most complete exposition of the muscular system that has yet appeared. Mascagni succeeded in injecting all the lymphatics, and published plates of them. Reil and Scarpa engaged in dissections of the nervous system, and gave finished delineations of it. Haller and Wolff illustrated the minute anatomy of the heart and arteries. Bichat introduced the science of general anatomy, which has produced such great changes in the doctrines of pathology. Many other names of continental anatomists figure in the same period, with well deserved lustre, but are too numerous to be specified.

While these immense accessions of knowledge and ardor in the prosecution of anatomy had been in progress for two centuries on the continent of Europe, the medical history of Great Britain presents, with the exception of Harvey's discovery of the circulation of the blood, little or nothing of distinction. But about the middle of the last century this inaction was interrupted by the labours of the two Hunters, William and John, both of celebrated memory; and by the second Monro of Edinburgh.

Doctor William Hunter formed an extensive museum, and published a collection of plates on the gravid uterus, which from their accuracy, and the style in which they are executed, must remain among the most classical contributions to the profession. John Hunter established a museum upon a scale of extent, variety, and neatness, which made it among the most valuable in Europe, to say nothing of his uncommon merits as a physiologist and pathologist. He was remarkably nice in his processes of injecting, dissecting, and putting up preparations, in which respects his cabinet was unique. Doctor Monro also formed a cabinet, and laboured with such success on the nervous system, as to obtain much reputation.

The present century, without introducing any great innovation in anatomy, has yet been fruitful in detached contributions, and is remarkable for works of much merit in their style of execution. The most valuable have been published in Italy, they are Caldani's plates of the size of life, having been selected from the most approved of all countries up to that period, with some few original ones; also Mascagni's *Anatomia Magna*, decidedly the most finished work which has yet appeared in any country. Next to these is the work of Julius Cloquet, with lithographic prints, well executed, and containing a complete body of anatomy. To Messrs. Bougeray and Jacobs we are indebted for a work in highly finished plates. There have also been several excellent works with plates on particular subjects, as Gall and Spurzheim on the Brain, and Sir Astley Cooper on Hernia. The latter gentleman, with a zeal worthy of his high reputation, was much occupied shortly before his death, with the structure of particular viscera, and had brought forward works of considerable merit on these points. He seemed desirous of infusing into the anatomical science of his country that vigor which is possessed elsewhere, the fruits of which zeal are now so conspicuous in the late English publications. The two Messrs. Bell, John and Charles, have likewise written on anatomy with considerable success; the latter had, in addition a very valuable cabinet, formed principally under his own direction and by his own labour, and though now dead, retains a permanent and distinguished reputation as the originator of some important novelties in physiology. There have been many other works deserving of notice, but want of time prevents me from doing justice to their contents and authors.

The more recent progress of anatomy is of the most gratifying kind. Impassable as certain boundaries seemed to be, even within my own period, they have now been cleared, many points formerly in doubt and obscurity have been elucidated, numerous observations positively new have been made. The nations generally of Europe have felt the im-

pulse, and a long catalogue of names may be made of men justly distinguished for their contributions to the cause of anatomical science.

Having presented this cursory glance at the progress of anatomy, from what may be considered almost its inception in the fourteenth century, to its present matured condition; we have the happiness of finding the path to it now fully explored and unobstructed. There are no hindrances to the acquisition of it, except we should prefer ease and indulgence to a manly and diligent application of our faculties, and the former I do not believe is likely to be your choice; on the contrary I trust that you are about to fulfil those duties which you owe to the profession of medicine, and to the expectation of friends. You have, indeed, all of those strong incentives before you which have actuated the dignified and illustrious men successively presented to you, to wit, personal advantage, reputation, and what is still more, the opportunity of taking a first step in that boundless and enchanting region of science, whose productions contribute so largely to the happiness of every well disciplined mind. The pleasures of sensual gratification pass away as a matter of course with that energetic period of life which generates and nourishes them, but while the mental faculties are still vigorous and susceptible of education, we should provide for the time when thought and intellect are to have *their* ascendancy, and when they will be called into requisition by the removal of seniors, and by the demands of society.

Permit me also to remind you, gentlemen, at this season of advice, and while we all may be supposed anxiously engaged in reflections on our respective duties, that if the distinguished success which has heretofore attended this school is to be continued, it must be as it has heretofore been, through the instrumentality of its alumni. In vain would the Shippens, the Rushes, the Wistars, the Physicks, and other great men adorn our annals, and illustrate the scientific history of this Institution, had there not been intellectual materials and moral worth of a suitable kind among its

graduates. But happily, up to the present period, you will find every where, in examining the history of this great nation, its most distinguished employments, civil, professional, political and pecuniary, largely held by persons who were your predecessors on these benches. Generally their elevation may be traced to their education, and to the happy exercise of their intellectual faculties; and dates its rise from the training they have got within these walls. Look at the numerous schools of medicine diffused over our land, you will find also that they derive their descent from this as their common progenitor, that their ablest professors were once placed as you now are, with the world before them, and but little except their own good talents and determination to sustain and direct their exertions. I trust, nay I am sure, from the evidence before me, that the generations of aspiring and generous minds have not ceased in these halls; that you will be stimulated by the brilliant and successful example of your predecessors; that you will perceive in the vista of life the same avenues of preferment open to yourselves; and that with such strong incentives, your exertions will cease only when you have reached both honours and confirmed success.

