

Lectures and observations on medicine / by Matthew Baillie.

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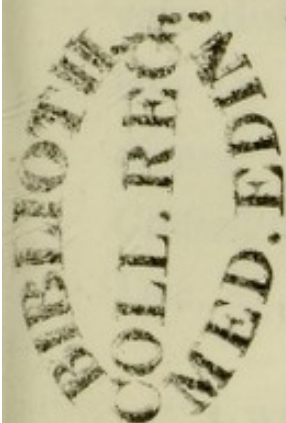
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LECTURES
AND
OBSERVATIONS
ON
MEDICINE.



BY THE LATE
MATTHEW BAILLIE, M.D.

LONDON:
PRINTED BY RICHARD TAYLOR.
1825.

LECTURES
AND
OBSERVATIONS
ON
MEDICINE

MATTHEW BARRIE, M.D.

LONDON:
PRINTED BY RICHARD TAYLOR

R54526

THE following Papers are printed for private distribution among the friends of the late Dr. Baillie, by his Executors, in obedience to directions left in the following Codicil to his Will: dated Cavendish Square, Dec. 27, 1821.

“ I WISH my two Introductory Lectures
“ to the course of Anatomy which I gave in
“ Great Windmill street, my Lectures upon
“ the Nervous System read before the Col-
“ lege of Physicians, and a short account of
“ my experience in the Practice of Medicine,
“ to be *printed*, but not *published*. One hun-
“ dred and fifty copies may be printed, of
“ which one copy may be given to each of
“ my more intimate medical friends, and the
“ remainder to the Royal College of Phy-

“ sicians in London. They are hardly of
 “ sufficient importance to be published, and
 “ yet I am unwilling that they should be
 “ completely lost, as something useful may
 “ be extracted from them. They will form
 “ together a small octavo volume.”

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INTRODUCTORY LECTURE

TO

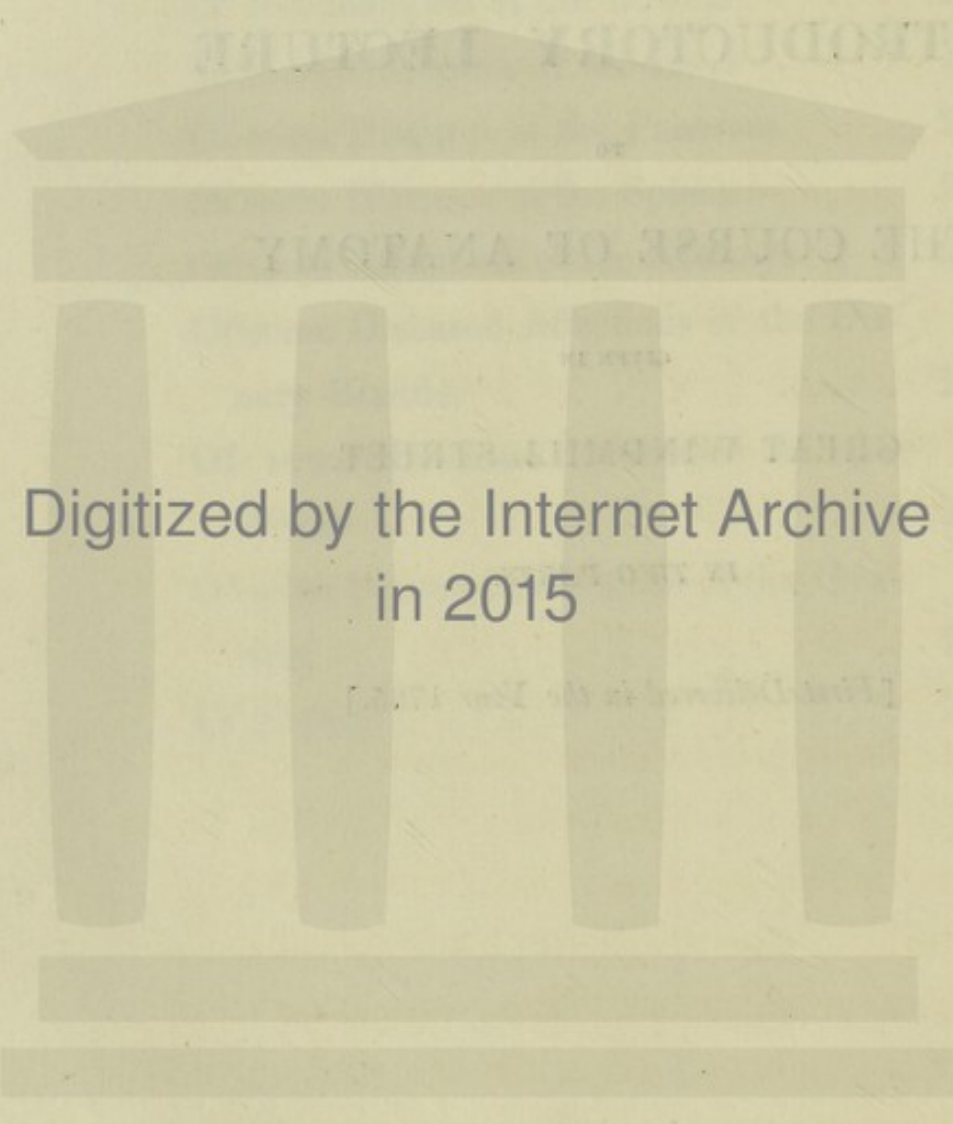
THE COURSE OF ANATOMY

GIVEN IN

GREAT WINDMILL STREET.

IN TWO PARTS.

[First Delivered in the Year 1785.]



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INTRODUCTORY LECTURE.

PART I.

IT is not necessary for the understanding of any science that we should be acquainted with its history. A science consists of an accumulation of facts depending on certain principles, and is more or less perfect according as the facts are more or less numerous, and the principles have been investigated with greater or less accuracy. It arises from small beginnings, and advances more rapidly or slowly, according to the circumstances which may have affected the curiosity and the industry of men. These circumstances have been commonly accidental, and are at all times to be considered as foreign to the science itself; for there can only be a necessary

connexion between the facts and principles of which it consists, and none at all with any particular age, or country, or persons. There must always have been the same effects and the same causes existing, whether they had been known or not,—whether they had been discovered at a later or more early period, in one country or in another, or by this or that particular set of men.

There is, however, a strong curiosity prompting us to inquire into the history of discoveries in any branch of science : nor is this void of utility. It points out the activity, the strength, and weakness of the human mind ; holds out the most powerful motives to exertion ; shows much to admire and to emulate, and exhibits enough to check pride and teach humility.

When we observe that by the industry and ingenuity of one man discoveries have been made which are of universal and permanent benefit to mankind, can we desire a stronger motive to call forth the exertion of our own talents ? But when, on the other hand, we observe that discoveries shall be obvious for ages, and yet escape a whole world of indi-

viduals, there will be no reason for us to be elevated with pride.

If such be the advantages arising from this inquiry, it would be improper not to gratify a very natural and laudable curiosity, or to withhold from you the strongest motives to industry which can affect an honourable mind. It is proposed, however, to trace at present only the grand outlines of the progress of anatomy; as the detail of the smaller individual discoveries will be better understood when those subjects are explained to which the discoveries relate.

By anatomy is to be understood the investigation of the structure of any animal body. This is very intimately connected with reasoning upon its functions, which has been called physiology. Indeed they are so closely allied together as to be inseparable; the one being the materials, and the other the principles of the same branch of knowledge; and they ought therefore to accompany each other in their history. It is impossible for men to examine the structure of an animal body, without reasoning about the use of the several parts; and it would be a very unprofitable pursuit

to attend to the one, except as being subservient to the other.

An animal body is obviously so curious in its construction, that it could not escape the attention of men possessed of any powers of observation. The human body, as being most familiar, and the more common animals, would necessarily claim some attention even in the rudest age, long before the annals of any history. It is in vain, therefore, to attempt fixing any precise beginning to anatomy: it arose, like other arts, insensibly; men being always possessed of considerable knowledge without being conscious of it, and without any foresight of its being separated into a particular branch of science. Much of anatomy was known before any attempt to arrange and separate this knowledge, and every thing was left to the impressions of memory, without order or distinction.

The external form of the human body must always have been well known, and a variety of circumstances would occasionally discover something of its internal structure. A considerable wound would point out the difference between the skin, the muscles, and the bones,

by exposing all of them together ; and a wound that penetrated into the brain, or into the chest or belly, would give some general knowledge of internal parts.

A more extensive source, however, of anatomical knowledge, would be derived from the more common and domestic animals. When animals were killed for food, they would afford a considerable opportunity of anatomical observation ; and men would naturally transfer the anatomy of such animals to the human subject, being led by a strong analogy from circumstances of general resemblance.

The custom of sacrificing to the gods, and particularly that of examining the viscera of animals in order to form a presage of future events, would add considerably to the stock of anatomical knowledge. By this time men had emerged from the rudest state of barbarism, had acquired some degree of civilization, and had become more curious, as well as better fitted, to observe what might come before them. The custom itself obliged them to attend more closely to appearances, and to observe varieties, which would give a consi-

derable opportunity of increasing the knowledge of the vital parts in an animal body.

The custom of managing the dead among some nations might also contribute a little to this sort of knowledge. Among the Egyptians the practice of embalming is well known to have existed ; and among this nation, so remarkable for its many superstitions and its extraordinary veneration of the dead, we are told that a particular class of men was employed for this purpose. In this operation they took out a portion of the viscera, washed them with antiseptic fluids, and filled the cavities with aromatic substances. Such a practice was exposing many parts of the body to observation, which would assist in increasing the knowledge of anatomy : but it was confined to a few, and those not the most respectable of the community.

By such accidental channels of information only could the knowledge of anatomy be advanced in the very early ages ; the means being very imperfect, and the men employed being little fitted for observation. To later and more enlightened periods we are to look for more considerable improvements, when men

had been more excited to inquiry, and were better able to investigate.

Among the ancient philosophers we find that the knowledge of anatomy and physiology was not neglected. Before any researches into the human mind, when mankind were beginning to emerge from ignorance into knowledge, the properties of matter first solicited attention. These were objects of sense, and had made the strongest impression ; and under such circumstances of advancement, nothing could more strongly excite the curiosity than the wonderful machine of an animal body. They were, however, not aware of the difficulty, of the length of time, of the patience, of the frequency of examination, which are necessary in the prosecution of such a study ; for they have been much more ready to form opinions than to inquire by dissections into animal structure. Of this class were Pythagoras, Alcmaeon, and Empedocles ; some of whose opinions have been handed down to us. They are generally ill-founded, because their knowledge of anatomy was very imperfect ; yet they are sufficient to show that their curiosity had been properly

roused, although the true road to inquiry was still unknown. Men had not then learned that it required a full investigation of facts before opinions could be justly formed, and principles established; a circumstance too often overlooked even in modern times.

Under such circumstances, it was impossible that the knowledge of anatomy should rapidly advance. It made a part only of natural history, claiming the attention of philosophers generally amidst other objects, but had not yet been detached, becoming a separate branch of inquiry. This is an improvement which cannot be made till knowledge has considerably advanced. The little that is known at first of the different branches of science does not require division and arrangement; and it is only the accumulation of facts that can point out their utility.

This improvement in physic happened in the time of Hippocrates; and anatomy therefore began naturally about this period to be cultivated by a particular class of men. We are then to consider this era as remarkable in the history of anatomy and physic; for it laid the foundation of their more rapid progress.

in succeeding times. Hippocrates was born in the first year of the 80th Olympiad, and 460 years before Christ, in Cos, an island of the Ægean sea. He is said to have been descended on his father's side from Esculapius, and on his mother's to have been allied to Hercules. He had been educated in all the learning of those times, but he was particularly attached to medicine. His desire of knowledge was so ardent, that he could not be satisfied with what might be acquired at his native place; but he travelled for a number of years through different parts of Greece and Asia Minor. During his travels he visited the temple of Diana at Ephesus, and took the trouble of arranging and transcribing the tables of cure which had been deposited there. It was a custom among the ancients, that all who recovered from any dangerous illness should, for the benefit of others, leave an account at the public temples, of the disease under which they laboured, and the remedies which cured them. A practice of this sort was likely very much to promote the knowledge of medicine; and attention to cures which were accumulated in such places was

probably the best education for a physician which the times afforded. Hippocrates, after having collected all the knowledge which the most ardent curiosity and excellent talents could acquire by travelling through the most enlightened countries, retired to his native island, there to exercise the profession of a physician, and to distribute the benefits of his former industry. Such merit as his could not remain long hid; and accordingly we are told that princes, excited by his reputation, were solicitous to allure him to their courts: but his attachment to his native country was so strong, as to make him resist the temptation of splendour and the favour of monarchs;—an instance of want of ambition perhaps more rare than his perseverance or his talents.

His works are very numerous, and are to be considered as medical rather than anatomical. The anatomy is interspersed through his works irregularly, except one or two particular treatises, which however lie under suspicion of being spurious. His works discover a most ardent curiosity, uncommon industry, and a singular sagacity of observation. It is not to be expected that at so early

a period his anatomy should be very perfect; for dissection of human bodies was not in use, and much could not be learnt from the occasional dissection of brutes. He still, however, deserves the most honourable mention in the history of anatomy, because by his means medicine rose at once to the dignity of a science, and anatomy became united to it, as necessary to its cultivation. After the time of Hippocrates anatomy still continued to advance, though slowly, being an object of curiosity both to the physician and to the philosopher. Aristotle, the celebrated tutor of Alexander the Great, pursued with uncommon ardour his researches into the animal structure, in which he was assisted by the liberality of Alexander himself. He has written a large work upon animals, in which he has introduced the human anatomy. This is very inaccurate; and indeed in one place he frankly confesses that the interior parts of a human body are very uncertain, and little known; and he recommends the examination of those animals which have the nearest resemblance to the human species.

Although little advancement had hitherto

been made in the knowledge of anatomy, yet it was increasing as an object of curiosity, and it afterwards laid the foundation of researches which were more judiciously undertaken, and more successful in their result.

Not long after the time of Aristotle lived Erasistratus, the first person we hear of who employed himself in the dissection of human bodies. He enjoyed the patronage of Nicanor king of Sicily, who encouraged him in the ardour of his researches by allowing all the criminals to be dissected who were put to death. This was a large field of observation; and yet, if report be true, it was not sufficient to satisfy the curiosity of Erasistratus; for he is said to have procured leave to dissect criminals alive, that he might have an opportunity of examining operations which take place only in a living body. This, however, must be considered as a popular tale, invented and propagated through idle credulity, and the natural gratification arising from impressions of wonder. It is to be regretted that his works are lost; not from any real knowledge that they would communicate to the present times, but that they might show

how far the mind is able to advance of itself, at a very early period, in a new field of knowledge, which had been involved by many conjectures, and many false comparisons of analogy. His great thirst after knowledge, and his extraordinary opportunities, could not fail of procuring him a most distinguished reputation; so that he became a guide and authority to future anatomists, as may be gathered from what remains of his observations in the works of Galen.

It would appear that he had seen on the mesentery of kids some lacteal vessels filled with chyle, which he has described with great exactness, although shortly, and without forming any conjecture about their real use. He had examined the valves of the heart, and knew its alternate contraction and dilatation. He thought that respiration was intended only for the purpose of supplying the arteries with air, and that digestion was carried on by the muscular powers of the stomach bruising the food. Such are a few of the observations of this celebrated anatomist, which show a general attention to the structure and the operations of the body, though some of them

are ill-founded, from want of collateral knowledge, and from ignorance of the method of experiments to ascertain facts.

About the same period flourished Herophilus, an anatomist of much celebrity in ancient times, who has been also said to have employed a great deal of time in the dissection of human bodies. His school was at Alexandria, where he enjoyed the patronage of the Ptolemies, princes well known for their liberal encouragement of science. Under such circumstances he had much opportunity of observation, which he was not disposed to neglect; for he has raised to himself a name admired by some succeeding anatomists even to a degree of servility. Fallopius has not hesitated to consider him as incapable of error.

Herophilus appears to have employed a good deal of time on the nervous system. One of the sinuses of the brain he has called *torcular*, and it is known at present by the name of the Torcular of Herophilus. The nerves he has clearly distinguished from tendons and ligaments, with which they had been formerly confounded. He had examined the structure of the heart, and he gave to the

large vessels names expressive of their structure and his conjectures of their use, which they retained till the celebrated discovery of the circulation, and even some time afterwards. His works, however, have been lost, like those of Erasistratus; so that we can have only a very partial view from what has been quoted of him by succeeding authors.

The last of the ancient anatomists is Galen, than whom few have deserved more praise, or been transmitted to posterity with more respect. He was born at Pergamus, a city of Asia Minor, about 131 years after the Christian era. His father had himself a turn for letters, and resolved to spare no pains nor expense in the education of his son, in whom even at a very early period he could observe extraordinary talents. He therefore put him under the tuition of the best philosophers; but died very soon, and long before he could form any certain prospect of his son's future reputation. About two years after his father's death, when he was about nineteen years of age, Galen betook himself to the study of physic; and to give himself every advantage, he employed several years in travelling

through different parts of Asia Minor, and some islands in the Mediterranean. At the age of twenty-eight he returned to Pergamus, his native city, where he was charged with the care of the gladiators; but he remained there only a few years, and then went to Rome.

His works show him to have been a man of uncommon industry, as well as extraordinary talents. He cultivated anatomy with ardour, and employed much of his time in dissection. Upon this subject he has written largely; but it is to be regretted that he was obliged to gather the human anatomy from analogy with those brutes which bear the greatest resemblance to man. Some modern anatomists have asserted that he never dissected a human body; and indeed this is probable from what he has said himself; for he mentions the having seen the skeleton of a robber as a very remarkable occurrence. But it will appear from his descriptions and comparisons that he had occasionally examined parts of the human body.

He was perfectly aware of the importance of anatomy to physic and surgery, and has spoken upon this subject with most uncom-

mon force and energy. "What," says he, in his second book of Anatomical Administrations, "can be more useful in wounds which are received in battle, in the extraction of darts, in the excision of bones, the reduction of luxations, the opening of fistulæ, than to be well acquainted with the anatomy of the extremities? It is of more use to be acquainted with the exterior than the interior parts of the body, as the shoulders, back, breast, the ribs, the belly, and the outward covering of the neck and head; for we are often required to cut into abscesses and sinuses. In the excision of bones it is necessary to cut and dissect; and if we do not know where the artery, vein, or nerve may lie, we are much more likely to be the cause of death than of health to the patient."

He was not only highly sensible of the importance of anatomy, but has been most judicious in his advice about the mode of studying it. He strongly advises the frequent dissection and examination of bodies, and that we should not trust to the accounts of others. Apes were dissected in his time; and he recommends such animals as approach

nearest to man in their resemblance. Still he is sensible of the deficiency, and advises the going to Alexandria to have an opportunity of examining the human skeleton itself. His descriptions are clear and well arranged, there being no mixture of one part with another, which is often to be found in ancient writers ; and those who are conversant in the dissection of apes bear testimony to their extreme accuracy. Little of physiology was known at this time, so that the principles laid down are often false ; but his reasoning upon these principles is remarkably clear and conclusive, and where the intentions of nature are not very obscure is often most accurate. Nothing can be more excellent, and indeed more elegant, than his account of the uses of the hand. He has written upon every part of anatomy ; so that his works may be considered as a system, exhibiting every thing known or discovered in this branch of knowledge in his time.

After the death of Galen we do not find that the spirit of improvement continued among his successors, but anatomy began to decline with other learning. The later pe-

riods of the Roman empire, which comprehended the greater part of the then civilised world, were not very favourable to the progress of science. The emperors were not disposed to patronize it; corruption of manners had already advanced to an incredible height; and the empire was distracted by continual alarms from the inroads of external enemies.

It is besides probable that the great reputation of Galen might have had some tendency to obstruct the progress of anatomy. Men are not disposed to exertion when they despair of rivalling what has been already done; and they are still less apt to labour when they are satisfied that the object of their pursuit is incapable of improvement. To these reasons we are probably to attribute the decline of anatomy after the time of Galen till the downfall of the Roman empire, when Europe became overwhelmed in a darkness which was not dispelled for many centuries.

During this interval we are not, however, to suppose that anatomy was entirely neglected. Physicians and surgeons continued to study Galen: but when they were con-

tented with studying him, it is evident that anatomy would always be losing ground.

After the downfall of the Roman empire in the West, learning was still cultivated at Alexandria, which had continued for ages to be a flourishing school, and was enriched with a most inestimable library. It seemed, however, destined that every persecution should interrupt its progress. About the year 640 the city of Alexandria was besieged by the Saracens, and this magnificent library was burnt.

These barbarians, not content with the ravages they had already committed, after having conquered all the countries adjoining to Arabia, crossed the Mediterranean, and in 717 besieged Constantinople, where the small remains of learning were still preserved. It was fortunate that they did not succeed in this attempt, but were obliged to raise the siege.

Being satiated with conquest, and having at length begun to experience the advantages of peace, these destroyers gradually acquired a taste for learning. Some of the Greek books which had escaped destruction were

translated into the Syriac and Arabic languages. Schools were opened in many of the chief cities of the Saracen empire, and learning began to be generally diffused. Anatomy, however, made no progress under the Saracen government. Physicians and surgeons were disposed to be content with what Galen had told them; and as most of them were Mahometans, they were prevented by their religion from touching any dead body.

Avicenna, who lived during the period we have been mentioning, has written a volume upon anatomy; but his work is to be considered merely as a compilation from Greek authors, particularly Galen; and whenever Avicenna ventures to differ from them he is generally wrong.

The time at length arrived when the Arabians were to suffer the same calamities from the barbarous ambition of the Turks which they had themselves inflicted on the eastern part of the Roman empire. The Tartars took Bagdad in 1258; and sometime afterwards they carried their hostilities against Constantinople and the neighbouring cities. Men

of learning fled from the danger that threatened them, and took refuge in Italy. Thus was literature transferred from the East to the West; and the light of knowledge began to dawn upon Europe, after a long night of the most impenetrable ignorance.

Anatomy revived at this period, along with other learning; but under such circumstances that it was impossible for it to make great progress. Men were so infatuated with their admiration of the ancients as to believe them incapable of error; and thought that no other task was reserved for them, than to endeavour to understand and to admire what they had done. The ancients were to them the only source of knowledge; they were the means by which they had been civilised from ignorance, and they looked up to them as having arrived at the perfection of human nature. This could only, however, retard the progress of knowledge for a short time. We are most disposed to admire what we have only lately known; but this impression becomes lessened by familiarity. It only required a vigorous mind to be able to see errors, and to venture to announce them; the

spell would then be broken, and science would begin to advance rapidly.

Such a mind was that of Vesalius. Before his time anatomy was cultivated with ardour by Mundinus, Achillinus, Berenger, Fernel, and especially by Sylvius ; but they had been still too much fettered by their admiration of the ancients to trust much to their own observation, and were astonished, as well as offended, at the audacity of Vesalius.

Vesalius was born at Brussels in 1514, of a family that had for a long time cultivated medicine. His grandfather and his father had both of them followed that profession ; and the former especially had risen to some degree of eminence. Vesalius himself was a man of uncommon talents, and possessed a degree of ardour in the pursuit of knowledge, and a firmness of mind, which were not to be damped by any difficulties. With such endowments his progress was rapid and extraordinary. In a few years he excelled his teachers Fernel and Sylvius, who were reckoned the first anatomists of their time. So great was his industry, and his passion for this study, that at the age of twenty-five he

had collected materials sufficient to publish a better system of anatomy than any that had then appeared. What, however, is perhaps more to be admired in Vesalius than any other quality, is his being able to shake off all blind respect for the authority of great names, and to trust to his own observation. This strength of mind was wonderful at a time when opposition to the authority of the ancients was considered as a species of sacrilege. Trusting thus to himself, and being unwearied in his dissections, he was soon able to detect errors in Galen and in his own masters. These errors he was not afraid publicly to mention and correct ; but such conduct was not likely to meet with the approbation of contemporary anatomists : all of them united against him with one common voice ; and Sylvius carried his bitterness to so great a pitch, that in some of his controversial writings he has not scrupled to call him *Vesanus* instead of Vesalius. This great man, however, possessed a mind which was not to be crushed by the opposition of envy. He answered their objections, and came off victorious, because truth was on his side. The reputation of Vesalius at length

became so great as to attract the attention of the court; and he was made physician to Charles the Fifth, but he did not long enjoy this distinguished situation. An occurrence happened which drove him from Spain to avoid the vengeance of the Inquisition. Having attended, during his illness, a Spanish gentleman who died, he obtained permission to examine the body; and when he laid open the chest, he was astonished to perceive the heart palpitating. This circumstance having reached the ears of the relations, he was pursued by them as a murderer, and accused of impiety before the Inquisition. By the influence, however, of Philip the Second, who had succeeded his father Charles the Fifth, he was allowed to escape on condition of making a pilgrimage to the Holy Land. Such superstitious times were not unwilling to cancel any action, however base, by one so meritorious. Vesalius had the appearance of guilt, although what he had done was not only innocent but laudable, and he was obliged to exhibit this public proof of his contrition. On his return from his pilgrimage he was invited by the senate of Venice to teach ana-

tomy in that city ; but he perished by shipwreck before he reached it, when he was about fifty years of age. Vesalius had been a very diligent dissector, preferring the evidence of his senses to any other sort of testimony. The description he has given of the bones is excellent ; and in his description of the muscles he has been very careful to separate what is found in monkeys and quadrupeds from what he observed in the human subject. His delineation of the bones and muscles shows the most minute attention. In every other part of anatomy he has also laboured ; and he has been liberal in mentioning what means he employed. He has no little secrets, but he gives plain practical directions how he has proceeded. His general description of the blood-vessels is accurate ; but he had not the smallest conception of the circulation, adhering in this respect very closely to the ancient opinion. He had marked very well the olfactory nerves, although he considered them rather as processes of the brain than like the other nerves ; and the fourth pair has entirely escaped his observation : but his description of the nervous

system at large shows a most unwearied industry. There is no part of the body which he has overlooked. He has not only examined the relative situation, but the structure of the different viscera ; and he has been very careful all along to mark the errors of Galen.

He perfectly got the better of the prejudices of authority. In one part of his works he has said, “ *Haudquaquam adeo Galeni verbis est acquiescendum, ut omnia, quæ illic in Aristotelem congerit vera et indubitata esse putemus.*” For his account of the organs of generation he deserves less praise than for that of the other parts of the body, his description being very inaccurate, and the physiology ill-founded. He has, however, done much by being able to throw off the prejudices of established opinion by thinking for himself, and by having pointed out the true method of studying the human anatomy.

So much curiosity had now been excited in anatomy, and it had become so much an object of cultivation, that it began to be rapidly improved : the barriers to investigation were broken down, and men had only to

observe and think. Under such circumstances it was likely that many anatomists should arise of distinguished reputation ; but many we shall be obliged to omit, as it is our present object to give only the history of great improvements. The proper method of studying anatomy was now introduced and practised, so that every day was adding some discovery : but in a short history it can only be allowed to trace the most considerable, a longer account being left to the gratification of a more prepared and opportune curiosity.

The greater discoveries and improvements in anatomy must comprehend either the explanation of a general system, or the invention of the means to investigate more accurately the structure of an animal body. The one really adds to physiology, and the other produces a more intimate acquaintance with the minuter structure of parts, which furnishes the materials for physiology.

The greater discoveries in anatomy may be confined to the doctrines of the circulation and absorption ; and the application of microscopes, together with the invention of injections, may be considered as the chief

means to develop the minuter structure of an animal body.

Before entering upon the history of the circulation, it will be necessary, in order to render it intelligible, to explain what the discovery is : but this shall be done very briefly.

By the circulation is meant the distribution of the blood through the body, and its return again to a certain point, in order to undergo a succeeding distribution. This is a very important function in the animal economy, for by it every part of the body is nourished and preserved ; is increased in growth, or is supplied when deficient. It furnishes the materials for the preservation, the growth and the repairs, of that very complex and delicate machine, an animal body.

To carry on this important office, a reservoir is employed, with tubes passing out and entering into it ; so that the fluid which has been carried out from the reservoir is returned again, after having served its purposes, undergoing a complete circulation. This whole apparatus in an animal body consists of the heart, the arteries, and the veins ; the heart being the reservoir of the blood, and

the chief active power of its propulsion ; the arteries being the tubes conveying the blood from the heart to every part of the body, and the veins being the tubes conducting the blood back to the heart to renew its circulation. The whole forms one great system complete in itself, the separate parts being dependent on each other. In order, however, to understand the progress of this discovery, it will be necessary to describe a little more particularly the apparatus, and the course of circulation in the human body.

The human heart consists of four cavities, two of which have been named auricles, and two ventricles. The right auricle communicates, by a large opening, with the right ventricle ; and the left auricle communicates, by a similar opening, with the left ventricle ; but the auricle and ventricle on the one side are generally entirely separate from those on the other. The veins open into the auricles, by which blood is poured into the heart ; and the arteries pass out of the ventricles, conveying the blood to the lungs, where it undergoes some change, and distributing it over the whole body. This forms what has been

called the complete circulation, being a process that is repeated in very quick succession while an animal is alive. The importance of the supply of materials to an animal body was always understood ; but it remained for a long time unknown what circuit was really taken, and what means nature so wonderfully employed, to produce a continual repetition of supply. This was a most important discovery ; for it explained one of the principal operations which are carried on in an animal machine.

It appears clearly from the works of Galen and of others who have copied from him, that the ancients had not the most distant idea of the true circulation. They believed that the blood was generated in the liver, and that there was a kind of flux and reflux of it in the veins ; that the finer part of it transuded through the septum of the heart, from the right to the left side, where it was mixed with the air inspired into the lungs, forming a vital spirit, and moving by a sort of flux and reflux in the arteries.

This opinion continued from the time of the ancients, even for many years after the

revival of learning, till by a more attentive observation of the structure of the heart and its vessels greater light was thrown upon this part of the animal economy, and at length the true circulation was completely discovered.

The first step towards this discovery was made about the middle of the sixteenth century by Michael Servetus, who was born in Villa Nueva, in Arragon, in the year 1509. He engaged himself warmly in theological disputes, and had the misfortune to reject the doctrine of the Trinity. This dreadful heresy brought upon him the persecution of Calvin and his adherents, which only terminated with his death, for he was burnt alive at Geneva in 1553.

Servetus has published a book entitled *De Trinitate Divina*, in which he exhibits many proofs of his knowledge of anatomy ; and it contains a very important step towards the discovery of the circulation. The passage expressing this new opinion is here quoted in a very faithful translation : “The vital spirit,” says he, “has its origin in the left ventricle of the heart, the lungs being subservient to its generation. It is a subtile spirit elaborated

by the power of heat, is of a yellow colour, and has the quality of fire; so that it may be considered as an exhaling vapour from the purer blood, containing water, air, and fire. It is produced by a mixture taking place in the lungs, of the inspired air with the elaborated subtile blood, which the right ventricle of the heart communicates to the left. This communication, however, does not happen through the septum of the heart, as is the common opinion; but by a wonderful contrivance the subtile blood is agitated in a long passage through the lungs, from the right ventricle of the heart, and is poured from the arterious vein into the veinous artery. In the veinous artery it is mixed with the inspired air, and becomes purified by expiration. Thus at length the mixture is attracted from the left ventricle of the heart by diastole, being a fit material for the formation of vital spirit. That there is such a communication through the lungs is proved by the various union and anastomosis of the arterious vein and veinous artery in the lungs. There is an additional proof from the bulk of the arterious vein, which would neither be of

such a nature, nor so large, nor send so much pure blood from the heart into the lungs, simply to nourish them ; nor would the heart be subservient after this fashion to the lungs.

“ The mixture, therefore, takes place in the lungs, and the yellow colour is given to the spirituous blood by the lungs, and not by the heart. If any person will compare this with what Galen has said in his 6th and 7th books *De Usu Partium*, he will plainly see that it has not been discovered by Galen*.”

We may observe from this passage, that at this period a considerable step had been gained towards the discovery of the circulation. The whole of the circulation from the right side of the heart through the lungs into the left was made out, and confirmed by very powerful arguments ; but Servetus had no idea of the veins and arteries in the body as belonging generally to the same system, and being subservient to the conveyance of the same fluid. He retained the ancient distinction between blood and vital spirit, but detected the absurdity of the blood

* Vide pages 143, 144, 145.

transuding through the septum of the ventricles, and clearly discovered its real course through the pulmonary artery, or what was then called the arterious vein.

This passage in Servetus seems, however, to have been overlooked by anatomists in general; and from most of their writings it would appear that no hint had yet been caught about the true circulation.

Not long afterwards, Columbus also made out the lesser circulation through the lungs. He was professor of anatomy at Padua, and had been a scholar of Vesalius. It is impossible to determine whether he might not have been acquainted with the opinion of Servetus; but we have the testimony of himself for its being a discovery of his own, which we ought not to refuse.

In a part of his works he has said, "There is a septum between the ventricles of the heart, through which every person thinks there is a passage to the blood from the right to the left ventricle. They mistake, however, very much, for the blood is carried through the arterious vein into the lungs, and is there attenuated; from whence it is carried, along

with the air, to the left ventricle of the heart through the veinal artery, which no one has either observed or left written, although it ought to be very obvious to all."

The lesser circulation through the lungs has here been distinctly described, but nothing has been added to what had already been said by Servetus. It had this advantage, however, that it was now brought more before the observation of anatomists. The title of Servetus's book must have prevented it from being much known to persons of this class, by whom alone such a hint could at all be apprehended.

The lesser circulation has also been mentioned by Cæsalpinus, an Italian physician, who lived a little after the same period; and he has even given some obscure hints about the general circulation through the body. He has remarked the swelling of the veins beyond the ligature, and is at a loss how to explain it upon the common idea of the use of these vessels; for, says he, "*debuisset autem opposito modo contingere.*" He has remarked, too, the course of the fluid in the aorta, and has derived a very strong argu-

ment from the valves formed at its origin.

“ *Membranis quibusdam ad ostia vasorum appositis, ut impediunt retrocessum.*” Still, however, he was entirely ignorant of the connexion between the arteries and the veins, and that the blood passes from the one to the other on its return to the heart.

We have here a difficulty striking only an observing mind ; and many ages might have elapsed without the discovery of the circulation, if there had not arisen some penetrating genius, such as that of Harvey.

Before we come to speak of the complete discovery of the circulation, it will be necessary to mention the discovery of the valves of the veins, which so much tended to facilitate it. In the cavities of veins are placed little processes, which are so contrived as to allow the blood to pass readily from every part of the body towards the heart, but most effectually prevent an opposite course. These processes consist of very fine membranes, which, when the veins are empty, fall collapsed upon their coats, so as easily to escape observation. This will account for their not being known to the very early anatomists,

especially as it is more than probable that they were not much accustomed to cut open or invert veins.

The valves of the veins, if they were not discovered, were at least first delineated and made publicly known by Fabricius Ab Aquapendente, professor of anatomy at Padua*, under whom Harvey studied. It was this discovery which probably first led Harvey to reflect on the course of the fluid in the arteries and veins,—an inference which now appears sufficiently obvious; but it might long have remained concealed, if it had not met with an observing mind, which readily caught it, and thus unfolded the most important general action in an animal body.

William Harvey, than whom there is scarcely any character of more celebrity in the annals of science, was born in the year 1578. His parents were in easy circumstances, and could therefore afford him a very complete education. He first attended a

* Charles Stephens, Jacobus Sylvius, Cannanus, and Vesalius, had seen the valves of the veins, but they were imperfectly known to them. Fallopius and Eustachius denied their existence.

public school in Kent, his native county, where he was initiated in the languages; and at the age of fifteen he went to Cambridge, where he became a member of Caius College. There he remained for six years, attentive to all the philosophy of the times; but he found that he could pursue with little advantage his favourite studies of anatomy and medicine, where neither of them was taught with any degree of reputation. He therefore left Cambridge, and went to Padua, at that time the most celebrated university for medicine, where he attended the lectures of the celebrated Fabricius on anatomy. It was there he acquired the greater share of his anatomical knowledge; and the particular attention of Fabricius to dissections, together with the discovery of the valves of the veins, seems to have directed the channel of Harvey's future inquiries, and to have laid the foundation of his future fame.

He continued three years in the university of Padua, where he took the degree of Doctor of Physic, and returned to England when he was about twenty-four years of age. After his return to his native country, he continued

the same industry and ardour for knowledge. Every day was adding to his reputation, which at length pointed him out as the most proper person to be chosen President of the College of Physicians. He afterwards became physician to St. Bartholomew's Hospital, and was appointed to give lectures there on anatomy and surgery. It was in these lectures, probably, that he first threw out his doctrine of the circulation; but he did not publish it till the year 1628*.

We shall not enter at large into all the arguments and experiments by which Harvey confirmed this doctrine, for they could not be made intelligible without more knowledge of anatomy than you are at present supposed to possess. It is sufficient to mention that Harvey has employed every argument at present known upon this subject, except those derived from microscopical observation, and that his language is clear and decided.

It is pleasant to observe how naturally he speaks of his first apprehension of the circu-

* He taught this new doctrine in his lectures about the year 1616.

lation. "I began," says he, "to think whether there could be any motion of the blood as in a circle; which I afterwards found to be true, and that the blood is propelled from the left ventricle of the heart through the arteries to every part of the body, as it is to the lungs from the right ventricle through the arterious vein, (now the pulmonary artery,) and that it again returns through the *vena cava* into the right auricle, as it returns from the lungs into the left ventricle through the veinous artery (now the pulmonary veins) as has been already mentioned."

This passage of Harvey, which is very faithfully translated, contains a most accurate and pointed description of the circulation, without any ambiguity, and would of itself be enough to establish his claim to this discovery; but he has extended it into a considerable work, by a great variety of experiments and arguments, so as to leave nothing to be done by his successors.

In this manner was completed the discovery of the circulation, perhaps the greatest in the animal economy; and if it may appear to any person viewing it at present, that after

what had been done by Servetus, Columbus, Cæsalpinus, and Fabricius, it required no very extraordinary effort of genius, it ought to be recollected how disposed the mind is to be governed by former opinions, and how little apt it is to be observant of what is unknown.

When the discovery of the circulation became generally diffused, it met with an unfavourable reception from many anatomists. Some of them denied the truth of what had been asserted; and others ascribed the discovery to some of the ancients. Arguments and experiments soon overcame the first kind of opposition; and the other was easily seen through, having arisen from those feelings of envy which will not bear even a merited superiority. But all is now hushed. Harvey is in full possession of the discovery, and the envious clamour of contemporary anatomists has ceased for ever.

INTRODUCTORY LECTURE.



PART II.

WE have now traced the progress of anatomy to the discovery of one of the most important functions in an animal body,—the mode of conveying the materials for its preservation and support. These materials are, however, always exhausting, so as to require a system of supply. This is accomplished by a certain order of vessels called lacteals, which arise from the inner surface of the intestines, and which, after having passed through a number of glands, terminate in a considerable duct, opening into a large vein near the heart. These vessels absorb the chyle from the intestinal canal, and convey it into the general mass of circulating blood,

into whose nature it is assimilated, thus becoming fitted for all the purposes of nourishment and growth. Such an apparatus was absolutely necessary, as there is a continual waste of blood from the various secretions of the body.

More, however, was still required. An animal must not only grow ; but there must be a certain regulation of its growth, giving a determined shape. It would be necessary also that an animal should be endowed with some internal power of removing what may be hurtful, or may irritate the body. This can only be given to a certain extent ; because, unless the power was in an infinite degree, there would always be some irritations sufficient to overcome it. For these purposes an animal is provided with a set of vessels arising from every surface, cavity, and interstice of the body, passing through similar glands with the lacteals, and having their termination in the same duct. Such vessels have been called *lymphatics*, from their being commonly filled with a transparent fluid. They are the same sort of vessels with the lacteals, and carry on the general action

of absorption throughout the body, producing thereby various effects according to circumstances.

This order of vessels is only of late discovery, probably because they are small, colourless, and often empty, so as not to be distinguishable from the neighbouring parts; and because anatomists were formerly little accustomed to dissection. In the present times they have risen to the notice which they deserve, since they are employed for as important purposes as any in the animal economy. The principles of their action are probably as well understood as that of the blood-vessels, but their particular anatomy is more imperfectly known.

It appears clearly from the testimony of Galen that white vessels had been seen by Erasistratus on the mesentery of kids. This, however, was not a discovery, for he did not distinguish them from veins; he had only observed what was presented to his eyes, without making any conjecture; and it was very long indeed after his time before they were known as a separate order of vessels.

Towards the beginning of the seventeenth

century, Asellius*, a professor of medicine at Pavia, discovered on the mesentery of a dog some small vessels filled with a white fluid. This was a new appearance, and attracted his observation. He thought at first that they might possibly be nerves; but when he pricked one of them, and perceived a white fluid to pass out, he was immediately struck with the impression of a discovery, and in the fullness of his heart called out *Ευρηκα*. The natural feelings of a mind in such a situation are most forcibly described by him. “*Quo viso, cum tenere lætitiæ non possem, conversus ad eos qui aderant, ad Alexandrum Tadinum et senatorem Septalium imprimis utrumque de amplissimo medicorum ordinis Collegio, et cum hæc scriberem tuendæ publicæ sanitati præfectum, Ευρηκα inquam cum Archimede ! †*”

This new appearance had so excited the attention of Asellius, that he was eager to establish and confirm it by other trials. He therefore laid open the belly of another dog, with the expectation of seeing the same sort

* Asellius was born at Cremona.

† Vide page 24.

of vessels ; but he was disappointed. This mortified him exceedingly ; but he recollected that the first dog had been opened a few hours after having eaten a hearty meal, and he thought that something might depend upon this circumstance. He therefore made the experiment upon a third dog, which had been plentifully fed a short time before ; and was rejoiced to see the same vessels again. He was now convinced of its being an uniform appearance, and he prosecuted his inquiries by extending these experiments to other animals. His enthusiasm was so great, that a week scarcely elapsed without the sacrifice of a living animal ; and he expressed a regret that similar experiments could not be made upon the human subject. He was, however, fully persuaded that this order of vessels could not be wanting in the machinery of so perfect an animal. From the circumstance of their being discoverable or not, according as the animal had been lately fed, or had been a long time fasting, he was naturally led to think that their office was connected with the food, and he believed it to be absorption.

Although he had clearly distinguished the lacteals to be a particular system of vessels, yet he was mistaken about their termination; for he believed that they ended in the liver, the trunk of the absorbents being still unknown. Attention to this subject was now, however, awakened among anatomists, and the error of Asellius was soon corrected. Picquet traced the lacteals into the *receptaculum chyli*; and he has mentioned this subject very clearly, and with singular modesty. “It is to be attributed,” says he, “to ill fortune rather than want of attention that anatomists should not know the chyle is neither carried to the liver, nor the *vena porta*, nor the *vena cava*, near the emulgent, as is the general opinion: but any one by dissection may perceive, as clearly as sunshine, that the lacteal vessels pass from the intestines to a certain receptacle, which, in brutes at least, occupies the space between the $\psi\omicron\alpha\iota$.” From the *receptaculum chyli* he traced the trunks of the absorbents to their termination in veins, so as to discover the whole route of the chyle. This, however, was only in brutes; nor was it the first time that the thoracic duct, or trunk of the ab-

sorbents, had been noticed by anatomists. Eustachius had many years before seen it in the chest of a horse, and had called it *vena alba thoracis*.

It remained still, however, to make the same progress in the human subject.

Veslingius is said to have observed in the year 1634 the lacteal vessels in man, and in the year 1649 the thoracic duct. This duct was afterwards brought to the general knowledge of anatomists by Peirish and Van Horne, and the lacteals were soon traced to their termination in it. The whole route of the chyle was in this manner completed in the human subject, which entirely overthrew the ancient idea, that the liver was employed in forming blood.

The lacteals, however, form only a small part of the absorbent system ; it extends over the whole body, absorbent vessels taking their origin from all cavities, and surfaces, and interstices. Much, therefore, still remained to be discovered ; and Olaus Rudbeck, a Swede*, has the honour of being the

* Olaus Rudbeck, born at Arosa in 1630.

discoverer of the lymphatic vessels. They had first, indeed, according to Haller's account, been seen by Veslingius, going from the spleen along the pancreas; but he had not established by experiments their particular nature. This discovery is therefore to be considered as Rudbeck's, who so examined them, as clearly to distinguish that they were a peculiar set of vessels, which had hitherto escaped the observation of anatomists. The account he has given of his discovery is very clear and natural. He says that in the months of October and November of the year 1650, and in the months of January, February, March, April, September, October, and November of the year 1651, he made many dissections in order to ascertain whether the lacteals accompany the *vena portarum*, and terminate in the *porta* of the liver, as was the common opinion among anatomists. For this purpose he made ligatures surrounding the *vena portarum*, and watched if he could perceive the course of the fluids in the lacteals. He found, however, no lacteals, and was surprised to discover some vessels filled with a transparent fluid, turgid on the side of

the liver, and concluded immediately that they were not lacteals, but a new set of vessels hitherto unknown ; and he called them, from the sort of fluid which they carried, *vasa serosa*. In the year 1652, in the months of February and March, he discovered the same sort of vessels passing to the glands of the groin, and traced them on to the thoracic duct.

These circumstances were sufficient to secure the discovery to Rudbeck, if he were not anticipated by any other anatomist. Thomas Bartholin, a Dane*, has laid claim to the discovery ; but by his own account he was not acquainted with the lymphatic vessels till the month of December 1651, and had not traced them on to the thoracic duct like Rudbeck. Indeed there is great reason to suspect that Bartholin has been uncandid upon this subject. It is more than likely that he had heard something of Rudbeck's discovery, from some inadvertent expressions in his own work ; and it is probable that a hint had been given him from the manuscripts

* Born at Copenhagen in 1616.

of Veslingius, which came into his hands, and were afterwards published by him. Bartholin speaks as if he were sore about the discovery, a circumstance always of suspicion. "We envy," says he, "no one's reputation; let the palm of fame lie open to all; only let the honour of the invention be left to us, as we trust we deserve it."

The same discovery has also been attributed to an English physician, named Joliffe. This rests upon the authority of Glisson, who has stated that in June 1653, when Dr. Joliffe was taking his degree at Cambridge, he mentioned to him that he had observed in various parts of different animals, as in the limbs, testicles, womb, &c., vessels filled with a watery fluid, which was directed in its course towards the root of the mesentery. It is very possible that Joliffe* may have remarked these vessels without any hint from others, because it is very possible for different persons engaged in the same pursuits to make the same discovery: yet as Rudbeck has fixed on a particular date,

* Joliffe himself has not written any thing upon this subject.

prior to that mentioned by Glisson, he must still remain in possession of the honour.

Although the lymphatic vessels were now certainly discovered, yet anatomists were entirely ignorant of their use, and their relation to the absorbent system. They considered them as appendages to the arteries, and supposed that they served the purpose of carrying back the watery part of the blood. There was, therefore, still room for a most important discovery in the physiology of these vessels. This was reserved for Dr. Hunter, who taught, so early as the year 1747, that the lymphatic vessels were not continuations of arteries, but were the real absorbents, arising from every surface and interstice of the body, and that they were a part of the same system of vessels with the lacteals, forming together one general system of absorbent vessels. This he proved by the strongest arguments, drawn as well from the minute injection of blood vessels, while the absorbents were not filled, as from the resemblance of the lymphatic to lacteal vessels, and their termination in the same common trunk. This discovery has been claimed by a celebrated professor of anatomy in Edinburgh; but I shall avoid entering

into the dispute. It is enough to say that Dr. Hunter taught this doctrine in the year 1747, six years before that professor declares himself to have made the discovery. Dr. Hunter has therefore an undoubted claim to priority, whatever praise may belong to any other person for having made the same discovery without assistance.

The arguments proposed in support of the opinion, that the lymphatics and lacteals should be considered as belonging to the same system, were so strong, that they immediately brought with them conviction; and this opinion was therefore readily embraced by anatomists. But still, as the vessels which had been seen were generally small, and had not been traced in every part of the body, it was believed that the lacteal and lymphatic vessels were not sufficient of themselves to carry on the absorption of the body, and that they were intended only to assist the veins in the performance of this function. It became necessary, therefore, in the prosecution of the subject, to discover whether the lacteals and lymphatics were the only absorbents. The idea of their being a distinct and complete system of vessels, fully equal to manage

the absorption of the body, forcibly struck the mind of Mr. John Hunter, and he immediately instituted experiments to confirm or overthrow it. For this purpose he made many experiments on living animals, by throwing different fluids into the intestines for absorption; and found that the lacteals always became filled with the fluid, but never the veins. The same opinion he confirmed also by injections, so as to establish it beyond a doubt.

All the observations and experiments relating to absorbent vessels had been hitherto confined to quadrupeds; and although it was natural to conclude that they likewise belonged to the other orders of animals, yet the subject was incomplete till this point was determined. Examinations were accordingly made for the purpose. Mr. John Hunter discovered absorbent vessels in birds and in amphibious animals; and these discoveries were extended by the late Mr. John Hewson, who was the first to ascertain the existence of absorbent vessels in fishes. In this manner were enlarged the views of the absorbent system, by showing that it belonged to all the

different orders of animals, very much confirming the idea that it was sufficient of itself to carry on the purposes of absorption in the body.

These ideas of the absorbent system began very soon, at least in this country, to be generally adopted, though it was still believed to be confined in its action to the absorption of fluids. Mr. John Hunter extended the influence of its action to the solids, which he deduced from the various changes in the growth of the body, and the different effects that take place in many diseases of the solids. This opinion is beginning at present to be generally received; and the merit of having first formed it has been claimed by the same distinguished professor before alluded to, but no sufficient evidence has been offered in support of this claim.

In viewing the present state of our knowledge concerning the absorbent system, it appears that the phænomena of its action are tolerably well understood; but the course of particular vessels has not been traced in every part of the body. This is a work of much patience and of considerable difficulty;

but it will be gradually rendered more and more perfect. Upon this part of the system Mr. Cruikshank has laboured perhaps more than any other person in this country, and with what success I need only appeal to the high reputation of his work. A most splendid work on the same subject has also been lately published by Mascagni.

The discoveries of the circulation and the absorbent system are certainly the two greatest in the animal economy. The one explains how every part of the body is nourished and preserved, and the other explains the mode of supplying the necessary waste in the support of the body. There have besides been many smaller discoveries; such as the structure of a particular viscus, a particular vessel, an excretory duct, a gland, &c.; but the history of such discoveries would be leading you into minutiae which you could not at present understand, and therefore it is omitted. This enlarged detail is left to future inquiries, when your curiosity may be gratified with more advantage.

The general means, however, by which the investigation of an animal body may be

extended and facilitated, are so important with respect to the functions of the animal economy, that an inquiry into their invention is very closely connected with even a general view of the progress of this branch of knowledge. It does not confine itself within narrow limits, but reaches to the very foundation of anatomy and physiology.

The utmost perfection of examination into animal structure appears to be, that the parts should be rendered exceedingly distinct to the senses. This can only be managed in two ways; viz. by making the senses more acute, and the parts themselves more distinct. On these two circumstances must rest all the improvements which can be made in examining the structure of an animal body. We are therefore to look for improvements in the examination of animal structure to the invention of magnifying-glasses, and to the arts of preparation, particularly of injection.

The first step in the progress of anatomy is to observe large and obvious parts. These would for some time sufficiently occupy the mind, and it would not occur that any thing further could be done. The whole of anatomy

would appear to be confined to what is readily observable. When the mind had, however, advanced further, and been enlightened by the general principles of natural philosophy, showing the infinite divisibility of matter, it would immediately occur that there was a large field of discovery, beyond what had formerly even been imagined, and a *terra incognita* lying open for research. This would appear the more important, as it must have occurred, whenever men were disposed to reason on the subject, that the actions of an animal body are not to be referred to the larger parts, but to the smaller, of which these are composed. Hence the examination of minute structure is evidently more connected with physiology; and if ever the latter is to be known at all, it must be through the medium of the former.

Anatomy was so far advanced as readily to receive these improvements about the time of Malpighi, an Italian anatomist, born near Bologna in the year 1638. In the early part of his life, before he cultivated medicine, he was singularly fond of philosophy, and it was probably this which led him to the application of the microscope to anatomical purposes.

He was the first who pointed out a new field in anatomy, by the application of an instrument, which must however, at that time, have been employed for many purposes of natural philosophy. It had been invented about the beginning of the seventeenth century by a Dutchman*, and was probably coming into considerable use.

As soon as the microscope was employed, it must have furnished new lights to anatomy. Malpighi accordingly made many new observations. He examined the minute structure of the parts most essential to life, especially the organs of secretion, and gave a new opinion about their structure. This example excited other anatomists to pursue the same plan, till at length microscopical observation went hand in hand with the larger and more palpable anatomy.

Leeuwenhoeck, a Dutch anatomist†, who lived soon after the period of Malpighi, con-

* Dribbel, a Dutchman, is said to have invented the microscope in 1621. This invention is also claimed by Fontana, a Neapolitan. Malpighi used it for anatomical purposes about the year 1661.

† Leeuwenhoeck was born at Delft. He began his microscopical observations in anatomy about the year 1680.

siderably improved microscopical instruments by being extremely careful in polishing the glass, and giving them an increased magnifying power. He was thence enabled to examine parts with the utmost minuteness; and the calculations he has formed often astonish, and almost stagger the belief. This kind of observation became at length very generally diffused among anatomists, so that they were rather too much attached to it, for the mind is naturally pleased with wonder. In their enthusiasm, however, they made many real and useful discoveries. The component parts of the blood, of milk, of oil, and of other fluids, were detected; the circulation of the blood was brought under the examination of the eye, in the transparent membranes of animals; and the structure of many of the solid parts of the body was much better ascertained. The same kind of investigation has been continued among succeeding anatomists, so that every part of the body has been minutely examined; but they have used more caution, as they have been more aware of the fallacies and errors which attend very minute microscopical observations.

It is not, however, sufficient for the purpose of examining into animal structure, that the vision should be more acute, but further that the parts should be so developed as to be more fitted for observation. This comprehends the art of preparation, which was not at all known among the early anatomists. Such an art would arise gradually, beginning with what was least artificial, and what might be observed in natural processes. The skeleton would therefore be the first sort of preparation, being suggested by the frequent exposure of the carcasses of animals, where the flesh has been dissolved away by putrefaction and the bones have been left bare. This would soon be followed by the preservation of some of the soft parts.

It must have been observed that the flesh of animals, when not very bulky and free from fat, became upon exposure to the air so thoroughly dry as not afterwards to imbibe moisture, and could then be preserved for any length of time. The power of certain antiseptic substances must have been known; and anatomists must have heard something of the mode of embalming among the Egyp-

tians. Some art, upon the same principle, would naturally be transferred to the preservation of parts for anatomical purposes. Many of the soft parts too, when left accidentally in water for a considerable time, would be found to separate, and their minuter structure to be evolved; and this would naturally suggest the employment of similar means for the more accurate examination of structure. Such modes of preparation required little art, and were pressed upon the attention from many common occurrences; and we find, accordingly, that this was the state of progress in preparations among the early anatomists, even a long time after they had been accustomed to dissections.

Swammerdam, in speaking of the advance of this branch of anatomy, has said, "that in the art of preserving parts, Van Horne excelled all other anatomists; and that next to him was De Bils, who showed his industry by drying the muscles of the whole body, and covering them with balsam. Hallpert Vander Wielsucceeded him, the scholar of Van Horne, and much superior both to him and De Bils. He knew the art of varnishing over the parts

of the body, of clearing vessels from fat and parenchyma, of filling cavities with air, and, what was still more wonderful, of drying in the air moist bodies ; and he was very liberal in permitting his preparations to be seen."

By this quotation from Swammerdam we see the state of the art of making preparations before that of injection had been discovered, and it is obvious how imperfect it was. Parts are in some measure confounded together and shrunk by being dried, so as to show nothing of structure ; and this method can be used only in preserving whole parts, which are better examined and understood by fresh dissection. The art of separating by maceration in water would teach more ; but it requires great care that the parts be properly unravelled, and that nothing be lost. This is therefore liable to considerable difficulties, and can at best only reach to a certain degree of accuracy. It cannot show the distinction between small empty vessels and fibres, so as to reach to the very minute structure of parts ; and we must therefore look to the discovery of other means more adequate to this end. Such means are af-

forded by the art of injection. In its beginning this was very rude and imperfect; but it has gradually advanced to very great perfection, and has become the chief means of developing the smaller component parts of an animal body. Indeed, the advantages arising from the invention of the art of injection are almost incredible. It has shown the course of the smaller branches of vessels, and the comparative vascularity of parts; has displayed the structure of many glands; has confirmed the doctrine of the circulation; has discovered the mode of union between the vessels of the mother and the child during pregnancy; and has assisted in disproving the connexion between absorbents and blood-vessels. This invention becomes therefore an object of considerable magnitude, even in a very general history of the progress of anatomy.

Very simple and imperfect means of injecting vessels were at first employed. Air was inflated to distend them, or some coloured fluid was thrown in; as milk, quick-silver, ink, and solutions of metals. Such means were liable to many inconveniences.

If a vessel be distended with air, and is afterwards to be dissected, when the least puncture is made through its coats, all the air escapes, the vessel collapses, and returns to its former obscurity. It affords, however, a ready means of showing the course, number, and size of vessels, which in that state may not be intended to be traced more accurately by dissection.

When fluids, such as milk, ink, and solutions of metals are employed for injection, although they render the vessels much more distinct to the eye, yet they will not allow any accurate tracing by dissection; for punctures must occasionally be made, and the fluid will escape. It is probable too, that even when no puncture has been made, the fluid would gradually evaporate, or transude through the vessels, so as to leave them empty.

For these reasons it became necessary that other materials of injection should be discovered, such as would not escape by punctures, nor leave the vessels dry by evaporation. When this difficulty was overcome, a contrivance was still wanting to apply a force capable of propelling the materials of injec-

tion uniformly through the minuter branches of a vessel. These two requisites were soon supplied by the ingenuity of two different persons. De Graaf*, a Dutch anatomist, about the middle of the seventeenth century invented the syringe, by which the force employed to throw the injection into vessels can be applied in a sufficient degree, and properly regulated. This very much resembles the syringe at present used; but the pipe he employed was curved and was much longer.

The proper materials of injection were discovered by Swammerdam† a little after this period; for De Graaf recommends the use of metallic solutions.

In his *Miraculum Naturæ*, Swammerdam has mentioned the composition of his injection, which is as follows:

“Take of white wax what is sufficient; melt it, and mix with it when melted a red, yellow, green, or any other colour which may be reckoned most suitable; draw up the injection with a syringe, and inject it into an

* De Graaf was born at Schoonhaven in Holland in 1641.

† Swammerdam was born at Amsterdam in 1637.

artery and vein." This was a very great improvement in the art of injection, but it afterwards admitted of some amendment.

Not long after this period injections were much employed by some anatomists; and Ruysch*, especially, carried this art to a very high degree of perfection. He exhibited to the world the specimens of his skill, but he could not prevail on himself to be so liberal as to discover the secret. A writer of his life, speaking of the perfection of his art, has said, "*Tali arte condita cadavera per plurimos servabat annos, ut dormire potius quam mortua viderentur.*"

While the injection remains surrounded by a quantity of fleshy substance, although it may give an idea of general vascularity, yet it is obvious that the course and number of single vessels must be obscured. This disadvantage would be most striking in fleshy and very vascular parts, such as the glands of the body; and it suggested another improvement,—that of destroying the flesh which surrounded the injection, so as to leave it

* Ruysch was born at Haye in 1638.

bare. This was accomplished by the application of a fluid which dissolved the flesh, but did not act on the materials of the injection. Dr. Nichols, who taught anatomy in London about forty years ago, was the author of this invention; and it has since been carried to much greater perfection, especially by Mr. John Hunter. Such is the general history of the invention of injections, an art which has been the source of many discoveries in anatomy, and has particularly rendered minuter anatomy more distinct and certain.

In this account we have endeavoured to be as general as possible, in order to avoid perplexing you with circumstances which might be unintelligible. We regret that this plan has prevented us from here paying a tribute of respect to many anatomists of the most distinguished eminence,—such as Winslow, Albinus, Haller, &c.; but as we proceed you will be made acquainted with them and with their various merits.

By the united efforts of men of distinguished talents during many centuries, human anatomy has at length arrived at great per-

fection. Every part of the body large enough to be examined by the naked eye has been often noted and described, and magnifying-glasses have been for a long time employed to develope the minuter structure. Much, however, still remains to be done in physiology. There is scarcely a great function going on in the human body which is clearly understood. The uses of respiration, the change of the food into chyle, and of the chyle into blood, the impregnation of the female, the mode of action in the nervous system, the mode of action in muscles, are all as yet very imperfectly known. These functions go on apart from observation, and depend upon the action of the minutest parts of the body. What still remains to be known can only be accomplished by a long chain of judicious experiments; and probably some of them will baffle the utmost efforts of human ingenuity. It is our duty, however, to go on. Experiments are every day affording new light, and enlarging the bounds of knowledge.

Anatomy has of late years been much more cultivated in this island than formerly. This has been very much owing to Dr. Hunter,

who, to a most acute understanding, added a very singular enthusiasm and love for the art. If anatomy be more generally or more perfectly known ; if surgery has received any improvements from it,—it is to be attributed in a great measure to the spirit of this single man.

He began the world with very moderate prospects ; yet by his industry and talents, without any meanness in his manner of advancement, he rose to be one of the first characters in this country*. He had been in-

* He was the second son of John and Agnes Hunter. His father was descended from the Hunters of Hunterstown in Ayrshire, a family of great respectability. His mother was a daughter of Mr. Paul, who was engaged in the malt trade, and was treasurer to the city of Glasgow. Dr. Hunter's father lived upon a small estate called Long Calderwood, in the parish of Kilbride, near Glasgow. He was a man of excellent understanding and of great integrity, but of an anxious temper. His mother was a woman of great worth, of a handsome person, and considerable talents. There were ten children, most of whom had more than the usual share of abilities. The females were handsome, and most of them died young. James, the eldest brother, who was of great promise, died young also, being not more than twenty-eight years of age. He had been bred to the law ; but disliking that profession, he intended to become a physician. He was con-

tended originally for the Scotch church ; but disliking many circumstances in that profession, he was easily persuaded by his friend Dr. Cullen to turn his attention to the study of physic. He began his medical education under the direction of Dr. Cullen, at that time settled in Hamilton, with whom he lived some years ; and he afterwards studied both in Edinburgh and London. It was intended that he should return to Dr. Cullen and take a share of his business ; the one to practise surgery, and the other medicine : but Dr. Cullen very generously gave up the

sidered by Dr. Hunter as the cleverest of the family ; and I have heard him say that if James had lived, he thought nothing could have prevented him from being the first physician in London. It would have been very remarkable to have seen at the same time three brothers at the head of the three departments of physic. James at the head of medicine, William of midwifery, and John of surgery. Dr. Hunter's father was occasionally obliged to sell portions of his estate, to meet the necessary expenses of so large a family, though managed with great frugality. This increased the constitutional anxiety of his mind ; and he was often kept awake in the night by thinking on the difficulties of his situation. Those portions of the estate which had been sold were many years afterwards repurchased by Dr. Hunter, when he had acquired some fortune from the exercise of his profession.

scheme when he learnt that better prospects were open to Dr. Hunter.

During his residence in London, Dr. Hunter, from his industry and fondness for anatomy, procured the good opinion of Dr. James Douglas, who engaged him to give his assistance in anatomical pursuits. He was now beginning to see some prospect of advancement, when Dr. Douglas died, leaving behind him a widow with a son and daughter. Dr. Hunter had lived but a short time with Dr. Douglas when this melancholy event happened; but from his good sense and good behaviour, he remained in the family as formerly, and was afterwards intrusted with the care of young Douglas in an excursion to Holland and to Paris. The ambition of Dr. Hunter, and his enthusiasm for anatomy, were so great, that his exertions were not crushed by the death of Dr. Douglas, but he continued his anatomical pursuits with unabating ardour. He very early communicated his ideas on the structure of cartilage to the Royal Society, which gave a very favourable impression of his industry and talents.

His taste for anatomy probably suggested

to him the idea of teaching it; and it was not long before he had an opportunity of showing himself in this character to the public. In the winter of 1746 he was engaged by a society of navy surgeons to give a few lectures on the operations of surgery, and the structure of the parts more immediately concerned in them. Upon this trial he met with such general approbation, that he was encouraged to take up anatomy the ensuing winter on an extended scale. What has been his success, and what his reputation, you need not be told. No one ever possessed more enthusiasm for the art, more persevering industry, more acuteness of investigation, more perspicuity of expression, or indeed a greater share of natural eloquence. He was uncommonly ready in his apprehensions, and singularly happy in making others understand what he knew himself. His arrangement of any subject was clear and judicious; he knew how far the attention would reach, and when it was beginning to decline; and he had a most happy talent of introducing anecdotes which might excite, amuse, and instruct.

He had first been intended for surgery, but he very much disliked all operations which might give pain. He was therefore easily induced to quit it, and to follow midwifery, for which he was singularly calculated by the delicacy of his manners, and a very quick perception of the caprices of the world. Not long after this change in the line of his profession, when his reputation was rising high, the University of Glasgow was proud to recollect him among her offspring, and to show a testimony of their respect by conferring on him the degree of Doctor in Physic.

At a very early period, having foreseen that he would soon be so much distracted by the multiplicity of business, as to prevent him from carrying on anatomy on the extended scale he wished to do, he sent for his brother, John Hunter, to assist him in these pursuits. What judgement he has shown in this choice the distinguished reputation of the latter has long ago determined. He was afterwards assisted also by Mr. Hewson and Mr. Cruikshank, whose merits as anatomists have been deservedly honoured by an ample testimony of the public good opinion.

Although the hurry of business a good deal interrupted the attention of Dr. Hunter from his favourite pursuit, yet this was in a great measure counterbalanced by the enthusiasm and vigour with which he devoted to it every moment of his leisure time. He very fortunately was not much influenced by the prejudices of common opinion, so that his mind was left clear in its exertions. This, joined to quickness of apprehension and a very chaste talent for reasoning, led him often to discover what had been overlooked by others. Considering the advanced state of anatomy in his time, he has acquired much more of this sort of honour than could have been expected. Had he only classed the lymphatics and lacteals together, so as to form them into one general system of absorbent vessels, it would have been enough to have secured the immortality of his name, for this comprehended nothing less than the discovery of one great universal principle in the animal economy. He has, however, enriched anatomy and physiology with many other discoveries.

That of the *decidua reflexa* has added to his reputation ; and he has delineated the

whole anatomy of the gravid uterus in its progress towards maturity, from its earliest state, in a work which will ever be highly valued while there is any taste for anatomy remaining in this country.

He explained the anatomy of aneurysm more perfectly than had been done before his time, and has established a more clear and certain reasoning upon it. A new species of aneurysm, called the Varicose Aneurysm, was discovered by him ; which, although arising from an accident not very uncommon, had entirely escaped the observation both of anatomists and surgeons ; and, what does not often happen to discoverers, he explained all the circumstances of it as fully and certainly at first as they have since been known. While reflecting upon what Baron Haller had discovered relative to the descent of the testicles, and the *hernia congenita*, he explained the true cause of that species of hernia sometimes found in adults, in which the contents of the hernia are in contact with the testicle. This explanation has been satisfactory to all future anatomists, and has been universally adopted. He also first de-

tected the true nature of the retroverted uterus, and made it generally known in this country. Such are his greater discoveries; but his mind was ever active, so as to be full of new observation.

What a share of discovery for one man! Has he not earned his reputation well? I am not fettered by delicacy on this occasion: I look upon relationship as nothing—as an accident. I consider Dr. Hunter only as an ardent cultivator and friend of science, and I speak of him as I feel and believe.

His reputation soon procured him the highest rank in his profession, and in time the honours he deserved. He was not only a member of the Royal and Antiquarian Societies in this country, but a few years before his death he was elected one of the foreign associates of the Royal Academy of Sciences, and of the Royal Medical Society, at Paris, honours that are only conferred on a very limited number of the most celebrated literary characters throughout Europe.

It is well known that the success of Dr. Hunter in his profession afforded him the opportunity of amassing a large fortune.

This he in a great measure expended in the promotion of science, by forming a collection, which not only reflects honour on him as an individual, but has become in no small degree an object of public interest to this country. Whatever may be at any time the reputation of the teachers in this school, let it be remembered that it is to him they owe the most ample materials for diffusing and advancing the knowledge of anatomy.

Anatomy and surgery have recently suffered a most severe loss by the death of Mr. John Hunter*. His mind was bold and inventive, treading constantly in a path of its own, without regard to the common track which had been followed by others. This was aided by an industry and enthusiasm, of which it would be difficult to find any superior example. With such singular endowments for the cultivation of science, his progress was proportionably great. There is no subject which he has considered, to which he has not added new light; and many branches of

* This was added after the death of Mr. Hunter in 1793.

science he has very materially improved. That two brothers should have become so eminent in the same pursuits is almost without example; and it is equally rare that two brothers should have formed collections of such magnitude for the public interests of science. These will remain to future ages as monuments of their industry and talents, and will call forth the grateful acknowledgements of posterity. By such examples may we likewise be excited to exertions that may not be unworthy the approbation of our country.

Every branch of knowledge ought to be more or less interesting according to its utility. None can be considered as useless, because there is an universal chain of connexion throughout nature; but some are much more important than others. Some afford little else than objects of speculation for the employment of the mind, while others are most closely connected with the happiness and welfare of man. If there be a superior claim upon such grounds to any branch of knowledge, it is due to anatomy. It teaches the structure of an animal body, and explains

its actions, as far as they are discoverable by the efforts of human ingenuity. If this only related to an animal in health, it would be more an object of curiosity than of real use. It would then only afford the means of indulging the mind in agreeable researches : but how infinitely it rises in importance when we consider it as the chief guide in restoring health to a body deranged by disease !

Disease may be said to be a wrong action either of the body generally, or of particular parts. Sometimes disease terminates by a gradual diminution of the diseased action, without any visible effects being left behind ; while at other times it produces some alteration of structure, or the formation of a new substance ; but these ultimately depend on diseased action.

A disease must always have relation to a healthy action, or healthy structure of parts, for it is only a deviation from them ; so that a knowledge of disease would appear to rest on a knowledge of the body in its healthy state.

It is unfortunate that the peculiar mode of deviation is not always discoverable ; but it

is evident that we cannot on any occasion become well acquainted with the deviation, without having previously known the original state. It is in this point of view that anatomy and physiology become so very important, as affording the most likely means of relieving the body when suffering under disease.

When the structure and natural action of any part is understood, it will best assist us in discovering what causes may influence the action which produces a morbid change, and how the application of other influences may probably counteract these causes, so as to protect the body from them. It will still go further ; for when the causes have been applied so as to produce their effects, it will be most likely to point out what may be serviceable in bringing back the parts to a natural mode of action.

The symptoms of a disease are appearances which take place while the body is under a diseased action, and depend on something more secluded from observation. If they arise simply from diseased action, no other change having been produced, they leave no

traces after death ; and there is only room for conjecture, which will be more or less reasonable, according to the understandings of different persons, or their degree of knowledge of the animal œconomy. But diseased action often produces a change of structure, or the formation of a new substance, or a new situation, such changes becoming themselves the cause of many symptoms, and being as it were intermediate between the symptoms and the diseased action. This gives the opportunity of anatomical examination, so as to trace more distinctly the nature of the disease, to establish a better reasoning upon it, to point out how we should act, what we may hope, and what we may fear.

It is by no means uncommon that diseases very different in themselves should have symptoms a good deal resembling each other. These may very often be confounded, especially by superficial observers ; but even men of the soundest judgement are liable to be mistaken. When, however, bodies are examined after death, and the disease is ascertained, the mind will be naturally led to

attend minutely to symptoms on a future occasion, endeavouring to detect some marked difference, by which the disease may be distinguished in the living body. Thus opinions and conjectures will be corrected by facts, and physic be daily advancing upon surer grounds.

Medicine, as far as has been hitherto known, has little power over some diseases; and it is of importance to separate these diseases from others, where it can really be of service. In such cases we should avoid teasing the patient with violent remedies, but endeavour to soothe and palliate. We shall be much better able to judge of these diseases when we have examined them in the dead body. Our ideas then become clear and defined, and we become more decided how it is proper to act.

There is nothing which renders a person so capable of discovering new diseases, as a knowledge of anatomy. Who can be so well fitted for this purpose as he who is familiar with the natural structure, and the diseased appearances in an animal body? What person but an anatomist could have discovered the varicose aneurysm, or, taking advantage

of Baron Haller's observations upon the *hernia congenita*, could have explained the cause of that species of hernia in which its contents are in contact with the testicle?

There are diseased appearances which are very common in an animal body, and which are of no great consequence ; and it requires a familiarity with the human body to be able to distinguish them from appearances strictly natural, or from diseases that are really serious. This last circumstance is of great importance, when we consider how often we are desired to examine bodies after death for the satisfaction of friends, or are called upon to do so by the laws of our country. Upon our judgement may depend the life of a fellow-creature. What reflection can be more serious to a man of humanity? But independently of these circumstances, there will be many cases of doubt presenting themselves to our minds, which we would wish to settle, but shall not be able, unless we are acquainted both with natural structure and diseased appearances. Indeed how otherwise is physic to be improved?

Anatomy is still more closely connected

with surgery than medicine. The first, being concerned in local diseases, is capable of receiving more light from it than the other, which is more employed about general diseased action. A surgeon who has taken care thoroughly to study anatomy, besides having a chance to be better acquainted with disease, and better able to distinguish between two diseases which are similar, is better fitted to act in any operation. His hand is acquainted with the knife, and he can cut more certainly and surely. The knowledge of anatomy fits a surgeon for performing operations in uncommon and difficult situations, teaching him where he should cut with freedom, where with extreme caution, and where not at all. It fills his mind with resources. It points out to him where an operation may be improved, and suggests to him what steps he should take when circumstances prevent an operation from being done in the usual manner. In a new situation it will tell him whether he may operate or not, and what plan of operation he is to follow. In fact, anatomy is the basis of surgery, and without it a surgeon can neither act with safety, nor accommodate

himself to the infinite variety of circumstances which may occur.

If then anatomy be of so much use in physic and in surgery, it ought to be earnestly cultivated by those who really wish to understand their profession, and to become respectable in it. This is not a trifling matter. Justice and humanity require every exertion where the lives of our fellow-creatures are concerned. There are many professions where negligence or inattention may be reckoned a folly, but in ours it is a crime.

We ought, therefore, to pursue with eagerness every branch of knowledge which may render us more useful in the profession we have chosen. I trust that from what you have heard, you are convinced how much anatomy is connected with it; but it can only be learnt by much labour, by patient and repeated observation of parts, by clearness of arrangement, and a disposition to reason upon what you see.

The parts of an animal body are so numerous and complicated, that in order to be retained in the memory they require a strong impression. This cannot be made by the

eye alone. The eye is quick, and so impatient as to run over a number of objects in a short time. It is therefore necessary that the hands should be employed, to confine the wandering of the eye, and attach it for a sufficient length of time to one object. It is for this reason that lectures by themselves never did make, nor ever can make a good anatomist. Too many objects pass before the eye in a short time to produce a proper impression. The practice of anatomy or dissection must be added, without which a man can only attain a wavering knowledge. But it ought to be our aim to have our knowledge certain and ready, resembling as much as possible original impressions, upon which we may be able immediately to judge and act. Without this, relief will sometimes be withheld till the opportunity of affording it is past; and it is always a pitiful business to hunt for knowledge as circumstances offer. There should be at all times a considerable fund ready to satisfy demands.

Anatomy cannot be learnt without the employment of the knife upon the dead body, that great basis on which we are to build the

knowledge that is to guide us in distributing health and life to our fellow-creatures. Need I say more to influence men of conscience, of humanity, of ambition, to be zealous and industrious? I am not willing to believe that you are difficult of persuasion.

Every man of sense will soon discover what is the most profitable method of study; but still it is right to direct you, and to save you as much as possible the expense of experience.

At lecture very short notes should be taken, notes rather of arrangement than of matter. The attention will in this way be more closely fixed, and there will be sufficient time to employ the eyes on the dead body, or the preparations, so as to receive proper impressions. These short notes should afterwards be extended in the evening, while impressions are distinct; an exercise which will teach you to think, to arrange, and to write. Be careful at lecture never to commit to paper what you do not understand, for you are not to attend to the words of the lecturer, but to his ideas. Be determined in not suffering the business of one day to encroach upon

the next ; for if you once relax, you must either hurry too much, neglect some things, throw up your plan in despair, or have recourse to the notes of another, which are but a poor substitute for your own impressions.

In dissecting, it will be right to attend to every thing that is exposed to view : render every thing as distinct as possible ; notice the relative situation of parts ; continue to observe them till they can be drawn in your fancy. This is knowledge.

I beg you will believe that the time of education is the most important in any man's life. He is then to decide his character and his success in the world. If education be pursued with industry, there will be a thousand occasions afterwards of gratification and comfort from it. If neglected, there will soon be much room for repentance ; but it will come too late. The opportunity will be past, and it will be necessary to submit to circumstances of humiliation. What feelings are these for a man of spirit, who knows that he once commanded the means of acting through life with honour, confidence, and satisfaction !

And success as well as character depends on attention to education. It is an ill-founded notion, arising from deserved disappointment, to say that merit is neglected. It is sometimes joined with circumstances that may have some influence in counteracting it, as for instance an unfortunate temper, or a disagreeable manner; but generally it meets with its due reward. The world does not often judge erroneously; persons of merit have at least the best chance of success; and who would be ambitious of the public approbation, if it had not the power of discriminating?

Thus you see, Gentlemen, that you are at present in a very critical situation, and that almost every thing depends upon your own exertions. A teacher can do little more than point out the proper road to improvement. I trust you will not be backward in doing justice to yourselves, and I hope you will not find here any want of attention, or even of enthusiasm in your service.

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 even of enthusiasm in your service. I am
 glad to know all persons who are so
 far advanced, and I am sure the efforts
 of the students will be successful.

THE
GULSTONIAN LECTURES,

Read at the College of Physicians, May 1794.

THE
GUSTONIAN LECTURES

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INSTITUTIS hujus Collegii Magnifici, et Præsidis mandatis, viri summa veneratione admodum digni, obtemperandi perstudiosus, quædam de cerebro et nervis proponere conatus sum. In hac corporis humani parte multa sunt penitus ignota, plurima per sese tam obscura, quam sententiis eruditorum diversis perplexa. Argumentum nimis est copiosum, ut de omnibus quæ isti pertinent tractare, et nimis difficultatibus implicitum ut ab illis expediri possim. De istis igitur argumenti partibus, quæ magis sint observatione dignæ, et quid verisimile videatur se-

quens, potius quam quid cæteri putaverint, pauca proponere aggredior. Oro ut huic incepto benigne arrideatis, auditores dignissimi, sentio enim quantopere benevolentia indigeam vestra.

LECTURE I.

THERE is no part of an animal body more curious in its structure, or more interesting in its examination, than the nervous system. This is the source of action and sensation, and in man is also the medium of connexion between the body and the mind. This system is composed of a considerable mass, called the brain, which is situated at one extremity of the body; from whence various processes, in the form of cords, pass to the other parts. In the different orders of animals the nervous

system bears a very different proportion to the general mass of the body. In quadrupeds the brain is larger in proportion to the size of the body than in any other class, man only excepted. In amphibious animals, fishes, and insects, it is proportionably much smaller; and some tribes of animals are so simple in their organization, as apparently to be without nerves and a brain altogether. Of this kind is the hydatid in sheep, which is an example of the most simple kind of animal. In these we may either suppose that the nervous fibrils diffused through the body are so small, as not to be capable of detection; or we may suppose that nervous matter is so blended with the general structure of the body, as not really to form a distinct organization. In animals of so simple a structure, which of these two conjectures is true it is perhaps impossible to ascertain, but Mr. Hunter was inclined to believe the latter.

In man the relative proportion of the size of the brain to the whole body is greater than in any other animal; and in comparing the human brain with that of the common quadrupeds of a much larger size than man,

as the horse, the ox, &c., the difference is very striking. The brain does not bear the same relative proportion to the size of the body in the very early periods of growth, and in the adult state. In a child at birth the brain is much larger in proportion to the size of the body, than when the growth is completed ; and in the early months of pregnancy this difference is still more remarkable. In proportion as the body more completely evolves itself, the relative size becomes less, the other parts of the body having then a quicker growth than the brain ; and it is a very considerable length of time after birth before the brain and the other parts of the body acquire their proper balance. The brain at an early period of existence is also a good deal different in its structure from what it is afterwards. It is much softer ; and in proportion as the child advances in growth it is found to be more and more firm. The difference between the appearance of the cortical and medullary substance, is at a very early period of life less strongly marked than it afterwards becomes. The power, too, of the brain to sustain pressure, is at this very

early period different from what it is when the child has made a further progress, and especially when it has arrived at the adult state. In a child before birth, and even for some time afterwards, the brain is capable of sustaining a great degree of pressure without injury ; and indeed this was necessary on account of the compression to which it was to be exposed in passing through the pelvis ; but the adult brain can hardly bear the smallest pressure without mischief.

The brain in the human subject, as well as in many other orders of animals, is inclosed in a bony case, called the cranium, which is intended for its protection. The degree of protection depends upon the thickness of the bones, and this thickness becomes greater as the protection becomes more necessary. It is very obvious that an animal can hardly be constructed so as to be protected against all degrees of violence. The thickness of the bones of the cranium is therefore suited to the degrees of violence which generally occur. Where the bones of the cranium are most exposed to injury from external violence, with fewer means of natural defence, there

they are thicker. Where they are protected by a thick application of muscles, or by the instinctive defence of the arms, they are thinner. Accordingly, at the posterior projecting part of the cranium the bones are thicker than any where else. Nature is willing to do enough; but wherever the formation of bony matter may be safely spared, it does not take place.

There is a long process derived from the brain, consisting of the same matter with the brain itself, and requiring the same protection, viz. the *medulla oblongata* and *spinalis*. The first is inclosed in the bones of the cranium, along with the brain; and the other is lodged in a canal surrounded with bone, so as to be equally protected. This canal is situated in the spine, and the bones composing it are so firmly connected together, as hardly to be liable to any risk either of dislocation or of compression from angles being formed by the motion of the bones upon each other. Although the general amount of the motion of the spine is very considerable, yet the motion allowed between any two contiguous bones is very small.

When the bones of the cranium are at any part removed, the brain does not come immediately into view, but there is a series of membranes which surround it. The most external has been named the *dura mater*. This is a membrane of great firmness, of a white colour, and with a few branches of vessels on each side ramifying upon it. It adheres very firmly to the cranium at every part, so as to require considerable force to separate it. This adhesion is chiefly by the medium of small branches of arteries, which pass from the membrane into the substance of the bones of the cranium. The adhesion is likewise very much strengthened by the close application of the membrane itself to the inside of the bones, and especially by the membrane running into the foramina of the bones at the lower part of the cranium. The adhesion is always so firm, as to keep the *dura mater* closely applied to the inside of every part of the cranium ; but sometimes it is præternaturally strong. In this case it is impossible perfectly to separate the *dura mater* from the bone, and portions of the membrane will be left adhering to it.

The *dura mater* consists of fasciculi of white fibres compacted into a firm membrane. These are more readily observable upon the outside of the *dura mater* than on its inside, because there they are coarser. The internal surface of the *dura mater* is finer and of a more shining colour than the external; and here the fibrous structure is less observable, except in particular situations, where coarse fasciculi are interwoven with the membrane, in order to give it greater strength. The *dura mater* may in some degree be considered as consisting of two laminae,—a coarser upon the outside, and a finer upon the inside; but these cannot be separated from each other, so as to leave natural surfaces. A number of fibres are always seen passing between the one and the other, by which they are united.

The *dura mater* in its use is partly to be referred to the cranium itself, and partly to the brain which it envelopes. It is the principal source of nourishment to the cranium; and in separating the *dura mater* from the bone, a prodigious number of fine vessels are ruptured, which pass from the one to

the other. With regard to the brain, the *dura mater* seems to have two uses. The one is that of forming septa between different parts of the brain, so that one part shall not press too much upon another; and this is particularly observable in the septum, which divides the posterior part of the cerebrum from the cerebellum. The other use is that of forming considerable canals for carrying back the blood towards the heart. The *dura mater* consists of materials very well adapted for the formation of large channels in the neighbourhood of a substance so little able to sustain pressure as the brain. These channels or sinuses are not capable of being distended by blood in the same manner as common veins, and therefore there is no risk of any considerable pressure upon this important organ. The brain can bear the pressure produced by the accumulation of blood in the small veins of the *pia mater*, when it is not carried to an extreme degree; but it could not bear the pressure arising from the distension of veins of the same size as the larger sinuses of the *dura mater*.

The *dura mater* was at one time supposed

to be capable of contraction like a muscle, and to act upon the brain for the expulsion of a nervous fluid ; but it is now well known to be perfectly inactive. It consists of a structure, having the same essential properties as ligament and tendon, and is totally incapable of any contraction ; it is also insensible when in its healthy state. Indeed it is wonderful how this opinion could ever have been formed, when it is considered that the *dura mater* adheres closely to every part of the cranium, and therefore could not exert any power of contraction were it possessed of such a power, and when it is considered that the brain could not sustain the pressure which must necessarily arise from this contraction. The *dura mater* accompanies the spinal marrow through the whole of its course ; but this will be afterwards more particularly noticed.

The next membrane which surrounds the brain is called the *tunica arachnoides*. This is a very fine transparent membrane, interposed between the *dura mater* and the *pia mater*. It is in most places applied very closely to the *pia mater*, so as to be separated

from it with some difficulty, and is so very fine and transparent as to escape observation. In some places, as under the junction of the optic nerves, or between the lobes of the cerebellum behind, it may be seen separate, and then it appears to be a membrane without any vessels large enough to admit the globules of the blood. When a fluid resembling thin jelly is thrown out under this membrane, as frequently happens during fevers, it may be seen in many parts separated from the *pia mater*, and is then somewhat thickened. It also attends the *medulla spinalis* through the canal of the spine; but of its use no satisfactory opinion has hitherto been formed.

The *pia mater* lies in immediate contact with the substance of the brain. It is a very fine transparent membrane, upon which are spread a great number of arteries and veins. These contain partly a florid and partly a dark-coloured blood, so as to produce a varied appearance; and there are few objects more beautiful than the *pia mater* crowded with blood-vessels. In most parts there is no adhesion between the *pia mater* and the

dura mater ; but in some they are connected, as in the neighbourhood of the larger sinuses of the *dura mater*, into which the veins of the *pia mater* pour their contents. To the internal surface of the *pia mater* there are attached a great number of processes, which consist of a shaggy membrane crowded with very fine vessels. The vessels do not indiscriminately enter every part of the substance of the brain ; but in the cerebrum they enter between its foldings, which have been named convolutions ; and in the cerebellum they enter between its concentric laminæ. Neither do they pass in an equal number to every part of the brain ; but they chiefly carry their blood to the cortical substance, and rather seem to pass through the medullary substance, in order to reach any cortical which may lie within it, than to terminate in the medullary substance itself. In cutting through a portion of the medullary substance, a great number of very fine vessels are divided ; but these seem to be passing through that substance, and not ramifying in it. When a portion of the cortical substance is cut, there is no appearance of ves-

sels in it whatever ; but this arises from the vessels being very small, and from the colour of the cortical substance which obscures them. The vessels appear very numerous upon a successful injection, or when a part of the cortical substance is inflamed.

The brain consists of the cerebrum and the cerebellum, and is formed of two kinds of substance, the cortical and the medullary substance. The first is of a cineritious, and the second of a pure white colour. There is a layer of the cortical substance placed on the outside of the brain : this does not form a smooth uniform plane, but in the cerebrum is moulded into convolutions, a good deal resembling the convolutions of the intestines ; and in the cerebellum it is formed into concentric laminae. The convolutions are of a considerable depth ; and if any of them be cut through, it is seen to consist both of cortical and medullary substance. The cortical forms a layer of considerable thickness ; and if you look attentively upon its divided edge, there will be seen passing through it, and following it through all its windings, a very narrow lamina of medullary substance. This

is sometimes distinctly marked and sometimes obscurely, and has, I believe, been very little, if at all, observed by authors. The concentric laminæ upon the surface of the cerebellum are composed also of cortical and medullary matter. By this contrivance the quantity of cortical substance, as well as the extent of its surface upon the outer part of the brain, is very much increased, but with what view has not been hitherto discovered.

When the cerebrum is divided at the lower surface of the hemispheres, and upon a level with what is commonly called the *corpus callosum*, there is seen a large oval plane of medullary substance, which is skirted on the outside by the convoluted cortical substance. A little deeper than this plane, where you come to cavities of a considerable size, and bodies of regular but various shapes, there are many different mixtures of the cortical and medullary matter. Where bodies seem from their outside to be formed of cortical substance only, upon cutting into them there appears to be a considerable mixture of medullary matter, as in the *corpora striata*; and

where they seem from their outside to be formed of medullary matter only, upon cutting into them they are found to have a mixture of the cortical. The cortical is sometimes in a large proportion, as in the *thalami nervorum opticorum*, and *pedes hippocampi*; and sometimes it is in a smaller proportion, as in the *tuberculum annulare*, and the *crura* of the cerebrum. I hardly think that there is any particular structure of the brain composed purely of the one kind of substance or of the other, although the proportions of each in the various parts may be very different.

Of the intimate structure of the cortical substance I believe very little is satisfactorily known. Some have thought it to consist of nothing else than a congeries of very fine blood-vessels. It is evident, however, that no mere collection of vessels could be made to resemble the cortical substance. The pulpiness so remarkable in that substance could not be produced by a simple collection of vessels, however minute; nor can one imagine a collection of vessels to have the same properties with any part of the brain. When a part of the cortical substance is injected

with fine injection, it appears to be very plentifully supplied with small blood-vessels; but still it is very far from being entirely composed of them.

Others have supposed that it was a glandular substance. There is no satisfactory evidence, however, in support of this opinion; and if we consider the analogy between it and the structures in the body which we know to be glandular, we shall be led to the belief that this opinion also is ill-founded.

Some modern anatomists and naturalists have examined the cortical substance with microscopes of very great magnifying powers, but the result of their observations has been different,—a strong proof that much dependence is not to be placed on their accuracy. Some have thought it to consist of very small rounded bodies placed in a transparent jelly; others have thought it to consist of rounded bodies placed in a fine cellular structure; and others have supposed that it consists of very fine tortuous tubes, with some small rounded bodies intermixed. With regard to myself, I cannot trust my own accuracy in making very minute microscopical observations; and

I frankly own that I am totally unacquainted with the minute structure of this substance.

The structure of the medullary substance is rather better known. In some parts of the brain, as the *pons varolii*, *crura cerebri*, &c., it appears evidently fibrous; and therefore in other parts, where the fibrous texture can hardly be detected, it is very probable that there is the same kind of structure. The fibres may be so small, and so uniformly applied to each other, as to escape observation. With regard to the minuter structure of the medullary substance, I believe that nothing satisfactory is known. By some modern observers its minute structure has been thought to be the same with that of the cortical.

In the brain there are four cavities of a considerable size, which are called ventricles. These are surrounded by distinct and peculiar structures of the brain, and contain a little water. This water is more limpid than what is found in the other cavities of the body, and very little or no coagulable matter is dissolved in it.

The two largest of these cavities have been called the lateral ventricles, and they are se-

parated from each other by a thin medullary septum. It has been thought by a distinguished modern anatomist, that there is a regular aperture of communication between them, under the anterior extremity of the fornix ; but other anatomists have been unsuccessful in detecting this direct mode of communication. The other cavities, called the third and fourth ventricles, are much smaller than the former, and communicate together by a small short canal.

Connected with the brain, or its membranes, there are some small bodies of a peculiar structure. These are the pineal gland, the pituitary gland with its *infundibulum*, and some small white bodies adhering to the *pia mater* and the *dura mater*, which have been named the glands of Pacchionus. Of their minute structure, or their use, nothing is distinctly known.

The brain is very plentifully supplied with blood, but this is not carried in an equal proportion to every part of its structure. The cortical substance has a much greater proportion carried to it than the medullary ; and indeed blood-vessels seem to pass only

through the latter to get at the former. There is no reason to suppose that the blood carried to the brain is different from the blood of the rest of the body, although this has been the opinion of some physiologists ; but it is here conducted with more contrivance than any where else, in order to diminish its momentum.

The blood of the brain is conveyed to it by four arteries of a large size ; these are the two internal carotid, and the two vertebral arteries. The blood in all of these is much checked in its impetus as it is about to pass into the cranium. The horizontal and varied channel of the *canalis caroticus* must exceedingly diminish the momentum of the blood in the branches of the internal carotid arteries ; and the winding course of the vertebral arteries between the atlas and the cranium, before they enter at the *foramen magnum occipitale*, must have the same effect upon the current of blood passing through the branches of these vessels. The junction, too, of the internal carotid arteries, and the basiliary round the *sella turcica*, must be subservient to the same purpose. It may be

observed that the branches of these vessels have thinner coats than the branches of arteries of the same size in other parts of the body, a circumstance which I believe has been little noticed. This may perhaps be intended with the same general view, viz. that they may have little power to act upon the blood which they contain, so that it shall be propelled almost entirely by the force of the heart, which has already been very much moderated by the contrivances formerly mentioned.

The veins of the brain terminate in the different sinuses of the *dura mater*, the use of which particular structure we have already endeavoured to explain.

The absorbent vessels of the brain have not as yet been discovered, or at least are not generally known. Some anatomists, above a century ago, supposed that they had observed absorbent vessels in different parts of the brain; but their observations are not satisfactory, and have been of no assistance to the inquiries of those who have succeeded them. An Italian anatomist has lately thought that he has detected some of these vessels

within the cranium, at its basis. He has not, however, traced them, by injection, into absorbent glands ; and other anatomists have not been able hitherto to detect the same appearances. There is every reason, however, to suppose that the brain has absorbent vessels as well as arteries and veins ; but they cannot be very obvious, or they must have been long ago ascertained. The nature of the substance of the brain must add very much to the difficulty of their detection ; but time, perseverance, and favourable opportunities will at length overcome every difficulty, and the absorbent vessels of the brain will be as certainly known to anatomists as those of other parts. Many circumstances show that absorption takes place in the brain, and it cannot be believed that it is carried on by a different apparatus, or on different principles, than in other parts of the body.

The *medulla oblongata* and *medulla spinalis* may be considered as an elongation of the brain, being formed by the junction between the cerebrum and cerebellum. The *medulla spinalis* is merely the continuation of the *medulla oblongata* passing into a canal of

the spine, and forming a convenient source for the nerves of the trunk and the extremities. It consists of a conical flattened mass, terminating in a point at the upper end of the loins, and gives off a great number of nerves upon each side, at regular distances from each other. The nerves which arise from its lower extremity are very large, and consist of fibres but loosely connected together, so as to bear some resemblance to a horse's tail; and from thence they have been called the *cauda equina*.

The *medulla spinalis*, as well as the *medulla oblongata*, consists of the same kind of substance with the brain itself, but differently arranged. The medullary substance is placed upon the outside, and the cortical within; and the proportion of the former to the latter is evidently greater than either in the cerebrum or the cerebellum.

The *medulla oblongata*, lying within the cavity of the cranium, has of course the same coverings with the brain itself; and they are continued into the canal of the spine, accompanying the spinal marrow. The *dura mater* in the canal of the spine has exactly the same

appearance as within the cavity of the cranium, but does not adhere firmly to the bones of the spine. Upon each side, in the *dura mater*, there is a chain of small irregular cavities between its outer and inner laminæ, into which the veins of the spinal marrow pour their blood. These are of the same kind, and formed with the same view, as the sinuses of the *dura mater* within the cranium. The *dura mater* attending the spinal marrow is perforated on each side by foramina, for the passage of lateral nerves.

The *tunica arachnoides* is continued along the spinal marrow from that membrane within the cranium. Within the canal of the spine it is but loosely applied to the *pia mater*, so that it can easily be separated by inflation; and it then appears to be a very distinct membrane.

The spinal marrow is, last of all, covered by the *pia mater*; but this appears to be a less vascular membrane than where it covers the brain. This no doubt arises from the less quantity of blood, in proportion, which is wanted for the *medulla spinalis*, which consists chiefly of medullary substance. Had it

consisted principally of the cortical, the vessels to be seen on the *pia mater* would have been both larger and more numerous. Small processes of membrane pass into the substance of the *medulla spinalis* from the *pia mater*; but these do not put on any regular form, as in the cerebrum or cerebellum. Upon each side, the external surface of the *pia mater* is joined to the inner lamina of the *dura mater*, at regular distances, by short processes from a small firm tendinous substance. This has been named the *ligamentum denticulatum*, and is peculiar to the coverings of the spinal marrow, there being no such junction between the *dura mater* and *pia mater* of any part of the brain.

The arteries of the spinal marrow are small, and are derived chiefly from the upper extremities of the two vertebral. From the mode of their origin, the blood must circulate in them with very little impetus, which corresponds with the general plan of the arterial system in the brain. In some places small branches pass in by the lateral foramina of the spine, from the intercostal and lumbar arteries. The veins of the *pia mater* open

into the chain of small sinuses in the *dura mater*, and from thence the blood is conveyed by short communicating branches to the intercostal and lumbar veins. The absorbent vessels of the spinal marrow have not as yet been discovered, but still there can be no reasonable doubt of their existence.

There are a number of cords passing from the brain, or its appendages, to different parts of the body, which have been named nerves. Those within the cranium arise partly from particular structures in the brain itself, as the *corpora striata*, *thalami nervorum opti-
corum*, and partly from a substance formed by the junction of the cerebrum and cerebellum. A great number arise from each side of the *medulla spinalis*. None can be said to arise out of the common mass of the brain.

Nerves at their origin are either formed of one cord, as the optic nerve, or are composed of a single plane of fibrils, which afterwards unite together, as the eighth and ninth pairs of nerves; or they are made up by the union of a double plane of fibrils, as the nerves derived from the spinal marrow.

Some of the nerves are composed of pure

medullary matter, as the optic nerve ; but in the greater number this matter is so enveloped in a tough cellular membrane, as to render its appearance less distinct. In the olfactory nerves there is an evident junction of the cortical with the medullary matter, but in some of the others there is clearly nothing but medullary matter ; and it is extremely doubtful whether in the nerves generally, of the body, there be any mixture at all of the cortical.

The nerves appear to consist of little cylindrical masses of medullary substance inclosed in a tough cellular membrane. In this cellular membrane there are distributed a number of small blood-vessels ; but I have never been able to observe any distinct coverings of the *dura mater* and the *pia mater*, as many anatomists have supposed. With regard to the minute structure of the ultimate fibrils, I believe that nothing satisfactory is known ; and it would exceed the limits of this lecture to enter into an examination of the opinions upon this subject.

The nerves are distributed to different parts of the body in very different proportions.

The organs of sense and of motion are the most plentifully supplied with nerves; the glands of the body, in many instances, sparingly; and tendons, ligaments, bones, &c., either not at all, or the nerves which reach them are so small as to prevent their being distinctly traced.

In some parts of the body little swellings are occasionally formed in the nerves, which have been called ganglions. These have a very different appearance from a common portion of a nerve, being somewhat of a reddish-brown colour, and having a minute fibrous texture. Some nerves in the body form an intimate junction with each other, which has been called a *plexus*. This is remarkably the case with the nerves of the upper and lower extremities, and also with the nerves which supply the abdominal viscera. To enter into a minute account either of the ganglions or plexuses of nerves, would carry us much beyond the limits of such a lecture; and this inquiry would be the less satisfactory, as much upon both of these subjects is to be considered only as conjecture.

LECTURE II.

HAVING given in the former lecture a very general view of the anatomy of the nervous system, we now come to the explanation of the purposes to which it is subservient. There is hardly any part of physiology attended with more difficulties in its investigation, or more imperfectly known, than that of the nervous system.

We may be said to be entirely ignorant of the uses of particular modes of structure, both in the brain and nerves. The distinct use of the cortical and medullary substances in the brain has not been hitherto discovered. We are, if possible, less acquainted with the uses of their particular modifications and mixtures in the different parts of the brain. Why they are formed, for instance, into convolutions upon the surface of the cerebrum, and into concentric laminæ upon the surface

of the cerebellum; why the *corpora striata* have such a proportion, and such an arrangement of the cortical and medullary substance; and why in the *thalami nervorum optitorum*, or *tuberculum annulare*, both should be so very different. We are in the same state of ignorance with regard to the use of particular modifications in the structure of nerves, and more especially of the uses of ganglions and plexuses. The authors who have attempted to scrutinize nature in the detail of her wonderful formation of the nervous system, have not been aware of the weakness of their own powers, and how much they have exposed their presumption and ignorance.

Although we may be considered as totally unacquainted with the uses of the particular modifications of structure in the nervous system, yet the chief purposes to which this system in general is subservient are not unknown to us. It is the system through which impressions are communicated from the different parts of the body to the brain, thereby producing sensations; and it is the system through which the influence of the mind, as connected with the brain in volition and va-

rious excitements, is communicated to many different parts of the body.

The different parts of the body are not equally capable of receiving impressions which might afterwards be communicated to the brain, and therefore are not equally sensible. Some may be said to be highly sensible ; as the organs of sense, the muscles, and many of the viscera ; while others seem in general to have no sensibility whatever. Of this kind are the bones, ligaments, cartilages, and tendons of an animal body. In such parts the distribution of nerves has not hitherto been traced, and therefore we are not surprised at their want of this property ; but how all of them should be capable of sensation, when diseased, is a fact which it appears extremely difficult to explain.

In order that sensation be produced in any part of the body, it is necessary that several circumstances should take place. First, it is necessary that an impression be made on the nerves. This may take place either from the immediate application of the object itself to the nerve, as in the sensation of touch ; or from the application of extremely minute

particles which fly off from different bodies, as in seeing or in smelling. Whatever be the variety in the modes of impression, the same general rule is still applicable, and the impression must be made in some form or other. Secondly, a communication by nerves must exist between the brain and that part of the body where the impression is made. There is no other medium through which an impression can be communicated; and it may be interrupted by a variety of causes, which will be very soon explained. It is very natural to inquire whether there be any change produced in a nerve when conveying impressions? In answer to this we may say, that there is no change whatever produced in the external appearance of a nerve during this part of its function; but what change may take place in its very minute structure, is probably much too subtile to be detected.

The particular state of nerve which takes place while it is conveying impressions to the brain, may be interrupted or destroyed by various causes. It appears to be necessary, in order that the impression may be conveyed, that there be no discontinuation of

the matter of the nerve between the seat of the impression and the brain. Hence, if a portion of a nerve be cut out, it becomes unfit for conveying impressions ; and even if it be merely divided, the same incapacity takes place. The application of the divided parts to each other, so as to be closely in contact, will produce no change in the effect, for the impression will not pass from the one to the other. Some persons have supposed that when a portion of any nerve was divided, it not only lost its power of conveying impressions, but never recovered it. This opinion is, however, ill-founded ; there can be no doubt of the real matter of nerve being regenerated ; and there have been well-marked instances of nerves, after being divided, recovering their capability of conveying impressions, although they recover it very slowly.

When a ligature is made upon any nerve, it is also rendered incapable of conveying impressions to the brain. That particular state of nerve which takes place while it is performing this function is prevented by the ligature from being propagated to the brain, so that this organ receives no impression.

Tumours, according to their degree of pressure upon nerves, will produce more or less of the same effect. Every person has frequently experienced a temporary external pressure upon a particular nerve, when impressions have been conveyed imperfectly to the brain, in consequence of which there has been indistinct sensation. Tumours growing in the neighbourhood of nerves, especially hard tumours, occasionally produce the same effect. If such a nerve, or nerves, be near a bone, they may be so squeezed between the tumour and the bone as to convey impressions either very indistinctly, or entirely to lose this power.

The causes just now enumerated as interrupting or destroying the power of nerves to convey impressions may be said to be external, and exist where there is supposed to be no fault in the nerves themselves. There are changes also taking place in nerves, which produce the same incapacity.

One of these changes is when the nerves of any part become paralytic. When this is the case, there is usually no alteration produced in their appearance, but they look in every

respect like healthy nerves. They would seem only to have lost the power of taking on that state which is necessary for conveying impressions to the brain; but as we cannot tell what that state really is, we must be unable to discover what is the particular defect in the nerves which are so incapacitated. We know from experience that nerves recover themselves very slowly from this state, and in most instances very imperfectly. Changes are occasionally observed in the structure of nerves which are incapable of conveying impressions. I recollect a remarkable instance of this in one of the optic nerves, which was of a much smaller size than usual, and had entirely lost the common medullary appearance, being converted into a blueish, half-transparent matter. Under such circumstances of change it is probable that nerves will never recover their power of conveying impressions.

When an impression is carried along nerves to the brain, we are totally unacquainted with the change produced there, in order that sensation may take place. We cannot tell whether it is a change produced only at

the origin of the nerves along which the impression had been conveyed, or whether it is a change diffused over the whole mass of the brain. We may be said, if possible, to know less of the various changes produced by various modes of impression, from whence the great variety of sensations, of which the body is capable, is derived. Notwithstanding the state of our ignorance upon this subject, we know by experience that several circumstances may take place in the brain, by which it may either be unfitted to receive impressions at all, or will receive them very imperfectly. These circumstances are commonly various causes of pressure applied to the brain, of which the principal are the accumulation of water, and the extravasation of blood. The first produces its effect more slowly, and most frequently happens at an early age. The other produces its effect suddenly, and hardly ever happens but at the middle, or more advanced periods of life. Tumours of different kinds growing in the brain itself, or in its neighbourhood, occasionally produce the same effect; but these happen rarely in comparison with the two former

causes, and generally make a slow progress. It is also not improbable that changes may take place throughout the general structure of the brain, by which it may be unfitted to receive impressions from the nerves, or will receive them very imperfectly. We know that the brain is frequently changed from its healthy structure, so as to receive false impressions, as in many instances of mania; and therefore we may suppose that there are certain changes by which it may be incapacitated from receiving impressions distinctly, or perhaps from receiving them at all. If, however, there be such changes, they are, I believe, at present not well ascertained.

Most parts of the body are only capable of conveying different impressions which produce sensations of pain. These are very different in the same parts, according to the degree or the mode of the impression,—so that sensations of pain vary a good deal. There are some parts of the body where the sensations of pain may be said to be peculiar, as for example that of the testicle upon pressure. Were patients in general capable of comparing accurately these sensations,

and giving a precise description of them, it would afford more ready and certain means of discriminating many diseases than has been hitherto attained.

Some parts of the body are not only capable of receiving various impressions that produce sensations of pain, but also a great variety of other impressions, from whence other sensations are derived. These are the organs of sense; and they form, from this circumstance, the principal channels of our knowledge of the external world. They are five in number, and each has a very distinct and peculiar organization, suited to the kind of impressions which it is intended to receive. They have larger nerves of communication between them and the brain than belong to the other parts of the body, and in some the nerves are of a peculiar structure. Most of the organs of sense are placed near the brain, so that their impressions are communicated by a short route to this principal part of the nervous system; but the organ of touch is placed at a considerable distance. The organs of sense, except that of the touch, are each of them employed in receiving and

transmitting to the brain a great variety of impressions belonging to the same genus ; as the nose different impressions of smell, and the ear different impressions of sound ; but the touch is capable of receiving and transmitting impressions which produce sensations of a kind quite distinct from each other. The sensations of figure, and of hardness or softness in bodies, may be said to be different in kind. The same observation may be thought applicable to the eye ; for we derive from it not only sensations of colour, but of form, extension, &c. It is, however, probable, that in producing the last kinds of sensation, the eye is educated by the touch. We know that it is always corrected by the touch when it is wrong, or in doubt about the accuracy of these sensations ; and they can be produced totally independent of the eye. But the eye may be said to stand in a relation to the touch which it does not to any other organ of sense. It communicates many of the impressions which properly belong to touch, and even more readily than this sense ; but it cannot be educated to convey any impressions of sound, or smell, or taste. Im-

pressions are conveyed from all the organs of sense, except the eye, directly to the brain, without any intermediate state being produced ; but in the eye an image is formed, which is necessary for exciting the sensations peculiar to this organ.

These organs, conveying to the brain a very great variety of impressions, become the principal source of our knowledge ; but as they are only capable of receiving and transmitting impressions of qualities of matter, its real essence must always remain unknown. Although all impressions are conveyed through the medium of nerves to the brain, in order to produce sensation, yet all sensations are not felt in this organ. On the contrary, this organ has no sensations referable to itself but when impressions are made immediately upon it, or in some sympathetic sensations connected with impressions made on other parts of the body, as for example the stomach. Sensations are generally referred to the parts of the body where the impressions have been made, and they vary according to the degree and the mode of the impressions. In some cases the sensations are referred to a part of the body at a distance from the seat of the

impression. Thus when water is accumulated in the bladder to a considerable quantity, the principal seat of the sensation is at the end of the penis. Although there is an unpleasant sense of fullness in the region of the bladder, yet the most acute and marked sensation is at the other part. Indeed the latter always takes place, while the former is only produced when the accumulation of water is unusually large. There is no deceit in this reference of sensation, for by experience we know that it is connected with such a state of the bladder; and indeed, independently of experience, it is attended with a strong desire to empty the water, and a full conviction that with proper efforts this effect will take place.

There are many other instances where impressions and sensations produced in one part of the body are accompanied with sensations in another. Thus in certain affections of the head and kidneys, the sensation of sickness is produced in the stomach; and the same thing frequently happens when the uterus is pregnant. It may be observed, that sensations take place in the stomach, in consequence of impressions or sensations being previously excited in other parts, much

more frequently than they are produced in any other part of the body. These may be called sympathetic sensations, some of which would appear capable of being explained by a connexion among the nerves of particular parts ; but others cannot be explained upon this principle. It may be observed that these sympathetic sensations are not the same in all individuals, but often differ very much, such sensations taking place between certain parts in one individual, and between very different parts in another.

Sensations are sometimes referred not to the seat of the impression, but to the small extremities of nerves which have been accustomed to receive such impressions. Thus in an amputated limb, impressions made upon the extremity of the stump produce sensations which are referred to the toes or fingers of that limb. The impressions now conveyed from the cut extremities of the nerves of the amputated limb, used formerly to be communicated from the smaller extremities of these nerves in the toes or the fingers ; and the mind for some time refers the sensations to these smaller extremities, till this error is

corrected by habit. On some occasions it would appear that these false references of sensation are continued for years after the amputation of a limb, and perhaps in such cases they are never entirely corrected.

It is not intended to enter here into the detail of all the various circumstances which can produce change in our sensations. This would lead to a very extended inquiry, and therefore some of the principal will only be at present noticed.

When one kind of sensation is destroyed, some others become increased in consequence of it. Thus when all sensations communicated by the eye are lost, the sensations communicated by the touch and by the ear are improved. This improvement does not arise directly out of the loss of the other class of sensations, but it becomes in some degree necessary for the protection of the body that these other sensations should be improved; and by great attention to them when excited, and by frequently repeating them, an astonishing improvement at length is made.

After what has just been said, it is hardly necessary to observe that great improvement

may be made by a certain education in discriminating the sensations derived from every organ of sense. This education merely consists in a very close attention to sensations when produced, and in their being frequently subjected to this attention. Thus we can arrive at a great degree of accuracy in discriminating between different sensations of taste, or of smell, or of hearing, which are separated from each other by such nice shades of distinction, that they would be confounded by persons who had not paid attention to this particular species of education.

Habit has considerable influence in regulating our sensations, as well as many other functions of the body. In general it diminishes the force of sensations according to the degree of habit, or the frequency of their being excited. It connects sensations with objects with which they are not naturally associated. It can even change the nature of sensations, rendering those which were originally agreeable indifferent, or perhaps even disagreeable; and, on the contrary, rendering those at length pleasant which were originally disagreeable to us.

In many instances the sensation remains for some time after the impression producing it has ceased. Thus, if the hand is put into water either hot or cold, the sensation remains for some time after it has been taken out. This depends on the nerves continuing for some time in that particular state into which they had been thrown; and this state of nerve is conveyed to the brain, which produces the continuance of sensation.

Sensations are much varied in their degree of intensity by the sensations which immediately precede them, and in many instances are altogether changed. This is particularly evident in the comparative sensations of heat and cold.

The force of sensations is a good deal varied by the expectation of the mind. When they fall below this expectation, they seem less; and when they rise above it, they seem greater, than they would otherwise be. There are many other circumstances to be remarked which have much influence upon our sensations; but to enter into their consideration would lead us far beyond the ordinary limits of these lectures, and therefore they are en-

tirely omitted. What has been noticed here has reference only to those sensations produced by impressions from without. There is also a great variety of sensations produced, not by external objects, but by the general affections of our nature, and our power of distinguishing between right and wrong. We receive a sensation of pleasure from the observation of virtuous conduct, and a sensation of pain from the observation of the contrary.

We are conscious of the various operations of our own minds, which may be said to produce another class of sensations. Both of these form very interesting and extended subjects of investigation, which it is impossible at present to consider.

LECTURE III.

THE nerves are not only employed in conveying impressions to the mind, so as to produce sensations, but also in conveying the influence of the brain to the different parts of the body which are capable of being excited into motion. These parts of the body are called muscular, and have a peculiar organization, which it would be foreign to our present purpose to explain. The nerves are capable of being variously impressed, so as to excite muscles into motion.

The most common influence which is conveyed along nerves to excite the action of muscles is volition. We do not understand what is the particular state, either of the brain while volition is exerted, or of the nerve while an influence is conveyed along it to muscles ; and both of these subjects are perhaps beyond the boundary of human investigation.

We know that to the eye there is no apparent change in a nerve when conducting volition, and it is probable that there is also none in the brain while this power of the mind is exercised. The change, therefore, must take place in the very minute structure of the parts, which cannot be an object of examination. It is remarkable, that although the effect of volition upon muscles, when conveyed along nerves to them, is that of their being put into motion; yet the volition is never exerted towards the muscles themselves, but towards that change which is intended to be produced by their action. One might naturally be inclined to think that the volition would be directed to the muscles themselves which are called into action. Upon a little consideration, however, it is easy to see why this should not be the case. Were volition to be directed towards the muscles themselves, it would be necessary to understand what muscles ought to be called into action, in order to produce every variety of change in the motions of the body of which it may be capable. This, however, would be totally impossible in an infant, and indeed

is a knowledge which the most perfect physiologist has never yet been able to attain. Were it possible for such a knowledge to be attained, still a good deal of consideration would be requisite every time any complex action was to be performed, to know upon what muscles the volition was to be exerted; and if our judgement should be wrong, the volition would be improperly directed, and we should be disappointed in the effect which we intended to produce. It is managed by nature much more simply, and without any risk of mistake. It is enough to know what effect we desire to take place, and to exert our volition towards that effect, and the muscles which are calculated to produce it are immediately called into action. There is no difference in this process, whether the effect can be produced by the action of one or two muscles, or whether the nice cooperation of many be required; it is enough to will the effect, and this nice cooperation takes place as readily and as easily as the most simple action.

When the volition is exerted towards an effect which is to be produced by a long

succession of the same actions, these actions take place without our being conscious of any volition continuing to be exerted. Thus in walking, one step is taken after another without our being conscious of a succession of volitions, and the mind may be deeply engaged in the mean time in the most abstruse inquiry. Still, however, the muscles employed in walking will not act unless they receive the influence of volition ; but we lose the consciousness of it in other exertions of the mind which are more interesting.

The volition cannot be exerted for any great length of time upon the same muscles without producing the feeling of fatigue ; but this, like many other states of an animal body, is very much regulated by habit. The greater number of the muscles of the body are under the influence of volition, and these have been called for this reason voluntary muscles. Of this kind are all the muscles whose actions are not necessary to any vital function, and are only occasionally to be called into exertion.

There are other muscles upon which vo-

lition has a partial influence. Of this kind are such muscles as are employed in carrying on a vital function, but which are also employed for purposes that only occasionally take place, and are to be regulated by volition. Thus the muscles of respiration may be said, with regard to their common function, to be involuntary muscles. They are as invariable in carrying on respiration as the heart is in carrying on the circulation, and are as little dependent upon the attention of the mind. They are not, however, purely involuntary muscles ; for respiration can be varied by volition, both in the quantity of air taken into, and thrown out from the lungs, and in the frequency of inspiration and expiration in a given time. It was convenient, and often necessary, that this operation should in some measure be under the regulation of our will. The muscles subservient to respiration are also capable of producing certain effects upon some of the abdominal viscera, assisting them to expel what they may contain ; and this was to be in some degree regulated by our volition. For these

reasons, the muscles of respiration have been made partly voluntary, and partly involuntary muscles.

There are again other muscles upon which volition has no influence whatever. These are employed in carrying on functions which are intimately connected with life, and where there would have been a great disadvantage if they had been at all dependent on volition. Of this kind is the muscular structure of the heart and blood-vessels; and of the same kind, likewise, is the muscular structure of the stomach and bowels. The first of these structures is employed in the distribution of blood over the body; and the other in preparing a fluid capable of being converted into blood, which is intended to supply its waste, besides expelling the excrementitious matter. Had either of these operations been dependent on volition, they would have required constant attention in order to be carried on, and therefore the mind could not have employed itself in other pursuits; they would frequently have been managed very imperfectly, and would have run much risk of being altogether stopt. Indeed, upon the

supposition of these actions being voluntary, the body could never enjoy the refreshment of sleep, and must have been constructed in this respect upon a plan totally different from what it is at present. Although volition be a principal cause of the action of muscles, yet it is regulated according to circumstances, exerting on some muscles its full force, on others a partial influence, and on others none at all.

The different emotions of the mind are also conveyed along nerves to different muscles of the body, exciting them to contraction. Each emotion, when raised in a considerable degree, sets in action its appropriate muscles, producing a change in the countenance and attitude, which is expressive of the emotion. This becomes a natural language, and is perfectly understood in all countries ; for it depends upon an universal principle in human nature, and is not connected with any arbitrary customs of society. The expressions of the countenance and attitude in anger, revenge, fear, &c., when strongly excited, are the same in every country, and are universally understood. Volition has no share

in these actions : they may indeed be sometimes repressed by volition, when in a moderate degree ; but when raised to a high pitch, they readily overcome its opposition, which is then very feeble, and produce their full effects. Muscles are capable of being thrown into a much greater degree of contraction by emotions of the mind than perhaps by any other cause ; and it is this circumstance which gives the astonishing strength sometimes exerted by maniacs.

The principle of imitation is also another cause of the action of muscles. This may be said on most occasions to be influenced by volition, for we generally imitate what we have previously willed to imitate ; but the principle of imitation is sometimes quite independent of the will. This is best exemplified in the imitation of any gesture or motion which may have been singular, and may very much have called up the attention of the mind. This state of mind acts through the intervention of nerves upon certain muscles, exciting them to action, and producing an imitation of the particular motion or gesture. This is so far from being dependent on vo-

lition, that the mind is often not conscious of its taking place ; and whenever it becomes so, the imitation is repressed by an exertion of volition.

Internal impressions in some parts of the body are a cause of muscular action. Thus the application of the blood to the internal surface of the cavities of the heart, appears to be the cause which excites it to contract. Although the small nervous fibrils of the heart have perhaps never been distinctly traced to its cavities, yet there can be little doubt of their reaching them ; and the impression made upon their extremities is communicated to the other branches, so that those exert their influence also in exciting muscular action. It has been a doctrine very lately advanced, that there are no nerves whatever passing to the muscular substance of the heart, but that they all terminate in the coats of the coronary arteries. This, I believe, from what I have observed myself, not to be well founded ; and it should seem wonderful that the muscle of the heart should not be stimulated to action, through the immediate connexion with nerves, like the other

muscles of the body, but through the intervention of blood-vessels. This is to bestow upon blood-vessels an office which one would not be willing to admit but upon the most unequivocal evidence.

In the intestinal canal, the peristaltic motion is excited by the impression of the contents of the intestines upon the very fine nerves which reach the *villi* of the inner membrane. These are branches of the same nerves which supply the muscular coat of the intestines, and the impression is communicated from the former to the latter. The peristaltic motion is therefore produced without any impression being immediately applied to the proper nerves of that motion, but by a principle which has been established in the animal œconomy,—that impressions applied to the nerves of the villous are capable of exciting the nerves of the muscular coat. Over these actions volition has no power, and we are not conscious of their taking place: they go on entirely without our knowledge.

Nerves may be excited by external stimuli so as to produce the action of muscles. If a

nerve be pricked by any sharp instrument, as a needle, or be half divided,—or if any stimulating matter be applied, as a drop of concentrated acid,—the muscles which its branches supply will be thrown into a violent state of contraction. The nerve itself, however, remains perfectly still ; nor does it appear to undergo any change whatever. In the same manner, whether the influence of volition, or of excitements of the mind, or influence of any other kind be conveyed along nerves to muscles, the nerves themselves seem to undergo no change, however great may be the effect produced on the muscles in which they terminate.

Mechanical or chemical stimuli, applied immediately to muscles themselves, will excite them to contraction. This probably depends upon the very minute fibrils of the nerves being impressed, which are distributed through muscles in great numbers, although they are too small for observation ; and therefore in this case the impression is probably still conveyed from nerves to muscles.

In animals of so simple an organization that nerves have not yet been discovered in

them, the application of stimuli is known to be capable of exciting them to motion. Thus, if an hydatid from the liver of a sheep be put into water heated to the degree of heat of the human body, motion will be excited in it. This may be supposed either to depend upon fibrils so very minute as to elude observation, which are impressed by the contact of the heated water ; or it may be supposed that a nervous matter is mixed through its whole substance, without any nerves being formed, which nervous matter receives the same impression, and communicates it to the muscular structure. It is perhaps impossible to ascertain this point anatomically, and therefore every thing which can be said concerning it must be considered as merely conjectural.

These are the principal impressions which are known to be conveyed along nerves, and to excite muscles to contraction. They may be interrupted by a variety of accidents, which are of the same kind as those which sometimes interrupt the progress of impressions to the brain, and thereby prevent the different sensations from taking place.

If a nerve be divided, or a portion be cut out, it is rendered for a time incapable of conveying volition, or any other mode of impression, to muscles. At length, however, the divided ends of the nerve will be united, or a new portion of nerve will be formed to supply what had been removed, and the power of exciting muscles to action will be recovered.

If strong pressure be made upon any nerve, whether by a ligature, or by a tumour, or some other external cause, its power of exciting muscles to action is very much impaired, and on some occasions may be lost. It will, however, be recovered after the pressure has been removed, but more or less slowly, according to the degree of injury which the nerve had sustained.

The most common cause which impairs in nerves the power of exciting muscles to action, is that change which is called paralysis. This sometimes originates in some pressure upon the brain, but very often it belongs merely to the nerves themselves. Sometimes there are only a very few nerves affected with this morbid change, but it very

commonly extends to all the nerves of one side of the body. The nerves themselves, upon inspection, generally appear to have undergone no change ; but still there must be some, although it be of such a nature as not to be observable. Upon almost every occasion the recovery of nerves from this condition is very slow, and generally very imperfect. It would be an inquiry of great public benefit, to examinein to the causes why this complaint is more common in men than in women, and especially why in this very large town it is so often found in men, even at an early period of life.

Changes may take place in the brain by which it is rendered incapable of affecting the nerves with those different modes of impression, which are to be conducted along them for the purpose of exciting the contraction of muscles. These changes depend chiefly upon pressure, which may arise from a great variety of causes.

The power of nerves to excite the action of muscles may not only be morbidly diminished, but also morbidly increased. In this case, the muscles of some part of the

body are thrown into strong and repeated contractions, or may be continued in a state of permanent contraction. In neither of these cases are the muscles at all influenced by volition ; and however strongly it may be exerted to moderate the contractions, the effort is attended with no effect. On many occasions the cause of these complaints cannot be ascertained, although it is generally supposed to be some strong excitement applied to the brain. In some cases it has been found by examination after death to be a mechanical stimulus applied,—as for instance, a little bony process growing from the *dura mater*, and irritating the brain ; and in cases of permanent contraction, it is almost constantly found to be an irritation of some nerve, occasioned by a wound. Where the disease consists in a repetition of contractions, it is frequently in time removed, and therefore in such cases can hardly be supposed to depend upon any mechanical irritation applied to the brain. Where it consists in a permanent contraction, and where the cause is ascertained, the disease is most frequently fatal.

Habit has much influence in regulating the force, the velocity, and the succession of muscular contractions ; but it would lead me far beyond the limits of the present plan to enter into this subject particularly. Neither is it proposed to notice the changes produced in muscles during their contraction ; for this does not properly belong to our subject, which is intended merely to treat of the influence of the nervous system in exciting muscular action.

The nervous system and the body generally are after some time exhausted by the number of impressions which are conveyed along the nerves, for the purpose of producing sensation, or of exciting to action ; and some means are necessary for recovering from this exhaustion. This is done by sleep, which is a state wherein all the vital functions are carried on in the same manner as when a person is awake ; but where the functions not necessary to life, and which have been called the animal functions, are suspended. Authors have amused themselves by forming opinions about the precise state of the nervous system during sleep. Some have supposed that the nervous fluid

being previously exhausted, sleep was thereby produced; and during that state that a new stock of nervous fluid was formed. Others have supposed that the mobility of the nervous influence was much diminished, and that during sleep this property was gradually recovered to its full extent. It is obvious, however, that all opinions upon this subject must rest merely upon conjecture. We do not know the state of the nervous system during the full activity of its functions, and therefore we must be little able to discover what is its state when many of these functions are suspended. Although we are unacquainted with the exact state of the nervous system during sleep, yet we know many of the remote causes which lead to it. These are chiefly fatigue, either of body or mind; the gratification of appetites; a certain attention to the regular recurrence of the same impressions; an almost total want of impressions; and a powerful and long-continued application of cold. Most of these tend to exhaust the body, and therefore seem to lead very naturally to sleep, by which the powers of the body are recruited. It would appear

likewise to be necessary, in order that a person should be kept awake, for a certain degree of excitement to be applied to the nervous system; and when this degree of excitement is not supported, a state of sleep is gradually produced. This seems to be the most probable cause of sleep, where there is a regular recurrence of the same impressions, or where hardly any impressions at all are made upon the nervous system. There is probably no state, during the time that a person is awake, when there is a total want of impressions; but every person must have experienced a situation approaching to this, when impressions have been made very faintly, and sleep has very soon taken place.

It has been the opinion of many that the mind is always active, even during the soundest sleep. Of this, however, there appears to me to be no good evidence. It can only rest upon our recollection of what has passed during that state; and where nothing is recollected, I cannot see upon what ground of proof we are to infer that any exertions of the mind have taken place. Exertions of the

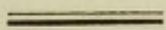
mind very usually attend what is generally supposed to be an imperfect sleep, but all its faculties are not equally exerted. The imagination is very active, while the exercise of the judgement is very imperfect. The imagination during sleep cannot, any more than when a person is awake, create new objects, but is only capable of forming new combinations. These combinations are often incongruous; but however great the incongruity may be, it is not, during a state of sleep, perceived by the judgement.

When sleep has been continued for a certain length of time, the powers of the body, and likewise of the mind, are recruited; but this time is much regulated by habit and by the different periods of life.

We ought next to take notice of the different opinions which have been formed about the manner in which impressions are conveyed along nerves, to excite the contraction of muscles. This, however, would lead to an extensive field of inquiry, carrying me far beyond the limits of this lecture; and little satisfaction could be derived from it,

for every opinion which has hitherto been formed upon the subject may be said to be conjectural.

From experiments which have been lately made by Louis Galvani of Bologna, and repeated and improved by others, it might be supposed that nerves excite muscles to contraction by conveying to them an electric fluid. It does not, however, follow from these experiments, that electricity is the ordinary means employed to excite muscles to action when volition is exerted, or the various emotions of the mind are called forth which produce the contraction of their appropriate muscles. But it is not intended to enter upon this very intricate subject, where it is not likely that at present we should arrive at any satisfactory knowledge.



SIC, Præses venerande, et Auditores dignissimi, quod hoc tempore proposui de cerebro et nervis disserere, ad finem perduxì. Multa fuerunt prætermissa ut in argumento

nimis copioso ; plurima in obscuro relictæ.
 In quæstione tam difficili, quid verisimilius
 videatur, sequi conatus fui, si non veritatem
 ipsam attingere potuissem. Benevolentia
 assuetæ confido vestrae, de hoc parvulo in-
 cepto vos humaniter existimatu-ros.

SOME BRIEF OBSERVATIONS

DRAWN FROM MY OWN EXPERIENCE

UPON

A CONSIDERABLE NUMBER OF DISEASES.

I HAVE now practised as a physician for more than thirty years, and have for the greater part of that time been so much occupied with visiting patients, that I have seldom been able to write notes of individual cases. It has occurred to me, however, that some advantage might be derived from my leaving a short record of the results of my experience in a considerable number of diseases*.

I am convinced that the most successful treatment of patients will depend upon the

* The plan of recording the results of his experience appears to have been first adopted by Dr. Baillie in 1819, when in consequence of some arrangements which he made, he hoped to have had more time at his disposal. There is reason to believe that he meant to have given a more extended account of his own experience: but almost every moment of the short remainder of his life continued to be occupied with the active duties of his profession; and he was besides constantly harassed with the feeling, that notwithstanding his utmost exertions, he was unable to answer all the demands made upon him, or to perform the various duties that were continually presenting themselves to his conscientious mind.

exertion of sagacity or good common sense, guided by a competent professional knowledge ; and not by following strictly the rules of practice laid down in books, even by men of the greatest talents and experience. It is very seldom that diseases are found pure and unmixed, as they are commonly described by authors ; and there is almost an endless variety of constitutions. The treatment must be adapted to this mixture and variety, in order to be as successful as circumstances will permit ; and this allows of a very wide field for the exercise of good common sense on the part of the physician. A physician who should be guided strictly by the rules laid down in books would be a very bad practitioner. In the following short observations on the treatment of various diseases, I shall state impartially the result of my experience, without entering into any speculative reasoning, which is often very fallacious.

Hanger Hill*, July 22, 1819.

* During the period of Dr. Baillie's attendance at Windsor, he resided for one summer at Hanger Hill, near Acton.

COMPLAINTS OF THE HEAD.

MANY persons of both sexes are affected daily with Headaches of more or less severity, for many months, and often for some years. They chiefly prevail towards the middle time of life, but occur often at an earlier period. They may take place in any part of the head, but are more commonly felt in the forehead, or over one eye, or in the back part of the head. Such headaches I have found in general to be very little benefited by bleeding, either general or topical. In the accounts which patients have given me of the effect of this remedy, they have said that they have either received from it no benefit at all, or that it has lasted but a few hours ; or that the headaches have even been worse after cupping or the application of leeches. I have generally found such headaches to be most benefited by temperate living, great attention to avoid improper diet, purgative medicines, and bitters. The best common medicine is rhubarb and soap, in

such doses as to give two motions daily. A few grains of calomel with an aperient draught, such as an infusion of senna with a drachm or two of Epsom salts given occasionally, as for instance once in a fortnight or three weeks, are sometimes of much use. A due degree of exercise taken daily, both on foot and on horseback, is likewise in some cases very serviceable. Some headaches I have known relieved by nervous medicines, but not frequently. In some cases this complaint is relieved by no plan of medicine or management whatever, but will gradually, after some months or years, subside. The seat of such headaches is, I believe, in the scalp, and not in the inside of the cranium. They depend chiefly for their cause upon the state of the stomach and bowels, or upon an irritable state of some of the nerves of the scalp. In most headaches of severity it is right to make one or two trials of the effect of topical bleeding, but not to persevere in the repetition of this measure for many months, as is often done, even though it produce no benefit.

The cutting the hair of the scalp very short,

and the application of cold, by a large sponge wrung out of cold water and applied to the upper part of the head, will often give great temporary relief when the skin has been previously hot.

APOPLEXY.

This disease, in its most severe form, depends commonly upon blood being poured out into the substance of the brain from some ruptured blood-vessel. This generally takes place in the medullary substance, near one of the lateral ventricles, but it may occur in any part of the brain. The milder forms of Apoplexy depend upon a distention of some of the vessels of the brain, from an undue accumulation of blood in them. I have known, however, one instance of fatal apoplexy where many of the blood-vessels were found, upon examination after death, to be much distended with blood, but no blood had been extravasated in any part of the brain.

The chief remedy in Apoplexy is large bleeding, to be repeated according to circumstances. Topical bleeding by cupping and leeches is likewise often of use. The

next remedies in importance are purgative medicines of considerable power, and acrid glysters. The head should be kept high or elevated, and cold may be applied with advantage to the top of the head. If the patient should recover by these means, the best plan of management, in order to escape from another attack, is to live almost entirely throughout future life upon vegetable food, and to abstain from wine, spirits, and malt-liquor. It will be of considerable advantage to avoid any strong or long-continued exertion of the mind. In a few instances, when the full state of the vessels of the brain had for some time subsided, I have derived considerable advantage from the moderate use of tonic medicines, and more especially of steel.

HYDROCEPHALUS.

I have known in my own experience but one instance of this disease being cured when fully formed. In this case all the symptoms were well marked, and the disease had made such progress that squinting and an irregular pulse had taken place. There had

been no peculiar treatment, except that mercurial ointment was applied daily to a considerable sore on the upper part of the head, which had been produced there by a blister. The individual is now alive, and is a young lady of good talents, which she has highly cultivated.

I have seen a few cases, in which there appeared to be a strong threatening of Hydrocephalus, that got well by the application of leeches and blisters to the head, and brisk mercurial purges; but I cannot determine whether these cases, if less actively treated, would have terminated in true Hydrocephalus or not.

EPILEPSY.

This disease appears to me to have become much more frequent within the last twenty years than formerly. If this remark be generally true, it may perhaps be accounted for by the progress of luxury, which must render the nervous system more irritable. I have known very few instances of Epilepsy radically cured, but a considerable number of cases in which the intervals be-

tween the attacks have been rendered much longer. The medicines which have appeared to me to have most influence in removing or retarding the attacks of Epilepsy have been the *argentum nitratum*, *viscus quercinus*, and the *oleum succini*. Of these, the first is the most powerful; but when it has been used for a good many months, it tinges the skin of some individuals of a dark colour. I have known two instances of this effect from it in my own experience. The bowels, too, should always be kept open, and the effect of brisk purgatives should be tried in the beginning of the disease.

It is of great use in the treatment of Epilepsy that the patient should live very temperately, and should avoid every thing which may tend suddenly to excite or to harass the mind. Patients should eat animal food sparingly, and should abstain from wine, ale, and porter altogether. The hair should be cut short, and cold applications should be applied to the head whenever the skin of it feels hot. This management is often of much use in rendering the attacks both less frequent and less violent. The causes pro-

ducing Epilepsy are various ; but I believe that in this disease there is commonly a tendency to a greater accumulation of blood than is natural in the vessels of the brain.

THE TIC DOULOUREUX.

The Tic Douloureux seems to me likewise to have become more common of late years, and I think it is more frequent among men than women. I do not recollect to have seen any instance in which it has been permanently cured, either by internal medicines or by an operation. I have known some instances of its being cured for a time (that is, for several months or even a year) by medicines ; and those which have appeared to me of most use are Peruvian bark and arsenic. The operation of dividing the nerve has in some instances prevented a return of the disease for one or two years, but has not, as far as I know, prevented it permanently. The courage and patience under suffering in this complaint, displayed by some individuals, have been truly astonishing.

OF SOME DISEASES OF THE NECK.

THE most common disease in the neck is the swelling of one or more lymphatic glands. This is most apt to take place in young persons who have fair complexions and delicate constitutions. It is always a very tedious disease, and is seldom much benefited by medicine. The remedies which I have found of most use have been sarsaparilla combined with soda, Peruvian bark combined with soda, and some form of steel. These medicines will, however, often have but a very imperfect influence upon the complaint. Sea air and tepid sea-water bathing are often beneficial; but I think that the air and waters of Malvern are more useful than any other remedy. I have known a good many cases which had been but little improved by the common remedies, and by a residence upon the sea coast with all its advantages, which have afterwards got quite well by the patients residing three or four months at Malvern.

BRONCHOCELE.

This disease is not very uncommon in this country : it is more frequent among women than men, and much more so among young than old persons. It is not often much benefited by medicine, but will frequently disappear of itself. Sometimes the swelling grows even in this country to an enormous size ; and I have known one or two cases in which the patient was destroyed by the swelling compressing the trachea and the œsophagus. The medicines which I have found of most use have been burnt sponge, soda, and mercury used externally, either as an ointment or in the form of plaster.

CHRONIC INFLAMMATION OF THE LARYNX
AND TRACHEA.

This disease occurs frequently in this country, and upon the whole I think is more common among men than women. It is often confined to the inner membrane of the larynx and the upper part of the trachea, but frequently it spreads downwards, even to the inner membrane of the bronchia. This

disease always continues several months, and often, with short intervals of amendment, for years. Not unfrequently it lays the foundation of future phthisis. Remedies generally produce only a very gradual influence upon the disease, and sometimes none at all. Benefit is not unfrequently derived in some degree from the repeated application, at short intervals, of leeches to the fore part of the neck, or the skin covering the upper bone of the sternum. The frequent application of small blisters to the same parts will occasionally be of use ; but perhaps the most useful remedy is a small seton inserted under the skin of the side of the neck, very near the larynx. Internal medicines often produce very little good effect ; but the medicine which I have found upon the whole to be the most beneficial has been the *extractum conii*. I have sometimes directed five grains of it to be taken three times a day for many weeks together, with manifest advantage.

OF THE QUINSY.

I have but one observation to make with regard to this disease, which is of some little

importance. It is usual to endeavour throughout the course of it to prevent suppuration from taking place, by the repeated application of leeches under the angles of the lower jaw. It is certainly very desirable that suppuration should be prevented, and that inflammation of the tonsils should gradually subside by resolution. I have found, however, by experience, that suppuration is by such means very often not prevented, but only that inflammation proceeds more slowly to this issue. Hence the patient suffers for a considerably longer time; and the suffering in this disease is often very great. If, therefore, one or two applications of leeches do not lessen materially the inflammation of the tonsils and *velum pendulum palati*, I should recommend the progress of the inflammation to be encouraged by the inhaling of warm vapour into the mouth, and the application of poultices to the external fauces. In this way the disease will go through its progress more quickly, and the patient will suffer much less.

OF SOME DISEASES OF THE CHEST.

I HAVE very little to say either with respect to pleurisy or peripneumony. The earlier, after inflammation has taken place in the pleura or in the lungs, that blood is taken away from the arm, the sooner will the disease be subdued. Blood should in these diseases be taken away largely, and if necessary should be repeated again and again after short intervals. All other remedies are insignificant in comparison of the abstraction of blood from the system.

When this remedy has not been applied early enough, nor in sufficient quantity, and an abscess has been formed in the lungs, which has burst, patients have, in the greater number of instances that I have seen, recovered but very slowly. Under these circumstances the medical attendant has little to do but avoid mischief. The constitution should be moderately supported, without being too much stimulated. Moderate doses

of myrrh, decoction of bark, or infusion of some bitter, are sometimes of use. Light animal diet, and even a little wine, are sometimes useful in such cases, but great care should be taken that no new inflammation be excited.

In the course of my experience throughout many years I have known a few instances of abscess being formed in the lungs without any previous pain in the chest, or difficulty of breathing, or observable fever. Such patients, upon some exertion of the body, or even without any exertion, have suddenly coughed up a considerable quantity, perhaps half a pint or more, of pus; and this has been to the patient the first intimation of disease. In such cases the inflammation of the lungs must have proceeded so slowly as to have produced little or no pain in the chest, and not to have alarmed the constitution so as to excite fever.

OF PHTHISIS PULMONALIS.

In the course of my medical experience I have known one or two cases of patients who recovered from phthisis which was apparently

fully formed. It is probable, however, that with regard to these cases I may have been mistaken; and that if I had inquired with sufficient accuracy into their history, I should have found that they were small abscesses of the lungs, of a common, and not of a strumous nature.

I have known a good many instances in which persons threatened with consumption have recovered by going into mild climates, or even into Devonshire or Cornwall; but I do not recollect a single instance in which they recovered when the disease had decidedly been formed. Change of air should be adopted very early, in order to give it the best chance of success. Such a variety of accounts has been given by patients, and even by medical gentlemen, of the comparative advantage of one place over another abroad, that I have found it impossible to decide which is to be preferred. I am disposed, however, to think that Madeira, the Hyeres, some parts of Portugal, Malaga, Nice, and Naples, are the best. It is very possible that different places may suit better with the constitutions of different individuals; and

this conjecture, if well founded, may explain the cause of there being such a variety of opinions upon the subject. A patient should, if possible, spend two or three successive winters abroad, in order to give the best chance of the disposition to the disease being subdued.

When no active inflammation is going on in the chest in phthisis, I have sometimes found advantage from patients being allowed to take a little white fish or light animal food at dinner. In a very few instances I have found benefit derived from their taking one, or even two glasses of wine diluted with water, after dinner; but wine is generally improper.

I have known of no medicine which has been of permanent and substantial use in phthisis; but I have sometimes found a good deal of temporary advantage derived from myrrh, from ammonia, and from light bitters united to the acetic acid. The frequent repetition of blisters, or a seton inserted under the skin in some part of the chest, are occasionally of considerable use.

OF HYDROTHORAX.

When dropsy of the chest does not depend upon any diseased structure of the heart or lungs, I have found it much more readily affected by medicine than ascites or dropsy of the ovarium. Not unfrequently, under these circumstances, I have known water of the chest relieved, or for a time cured, by medicine.

The medicine which I have found most beneficial has been mercury combined with squills and digitalis. Five grains of the *pilula hydrargyri*, combined with one grain of the dried powder of squills and half a grain of the dried powder of digitalis, given twice or thrice a day, have in many cases under my care either very much mitigated or for a time removed the disease. There has been some advantage from the mercury affecting slightly the salivary glands. Squills and digitalis are by themselves much less efficacious than when combined with mercury.

I do not recollect one instance of Hydrothorax being permanently cured, although I remember a good many cases in which the

symptoms were repeatedly removed by the same means in the same patient.

Where the difficulty of breathing has been very great, and the legs and thighs have been much swelled from anasarca, I have known much relief afforded by a scarificator and small cupping-glass being applied above the inner and outer ankle of each leg; and I do not remember any mortification attacking these small sores. The difficulty of breathing in such cases probably depended in part upon the water accumulated in the cellular membrane of some parts within the chest, and this was gradually emptied through the small openings made in the skin of the legs.

OF PALPITATION OF THE HEART.

PALPITATION of the heart may take place at any period of life ; but it is more common at an early period than any other, as for instance from fifteen to twenty-five years of age. Perhaps, too, it may be more common in females than in males ; but of this I am not very certain. At an early period of life it does not in general depend upon any diseased structure of the heart, but either on a morbid irritability of the nerves of this organ, or upon some imperfect state of digestion. When it takes place from either of these causes, it always continues for a long time, (often, more or less, for two or three years), but at length generally subsides. Rest of body and quietness of mind are two of the chief means which contribute to remove this disease. All quick motion of the body, and more especially walking up ascents, increases the complaint, and should as much as possible be avoided. Every thing which tends to excite or harass the mind has the same effect,

and should be shunned whenever it is possible. To rest of body and mind should be joined very temperate diet; and when this general plan of management has been continued for many months, or perhaps for a year or two, the disease usually subsides. Digitalis has sometimes been useful in mitigating this complaint, but frequently it produces no good effect.

Where the palpitation depends either altogether or chiefly upon the state of the stomach, it is gradually removed by temperance, by improving the condition of the stomach, and by keeping the bowels free from costiveness. I remember one case in which palpitation of the heart had taken place, and had continued for six months, in consequence of gout having attacked this organ. In this case the palpitation ceased suddenly and entirely when the gout attacked one of the feet in a full and decided form. This person is now alive, and has continued generally in good health, although it be nearly twenty years since the attack of palpitation.

In some young persons palpitation depends upon an enlargement of the several

cavities of the heart, produced not unfrequently by rheumatism attacking this organ. This cause of enlargement of the heart was overlooked by the physicians of this country, till it was discovered by the sagacity of my esteemed friend the late Dr. David Pitcairn. The enlargement in general goes on increasing till life is destroyed ; but I have known two cases where the enlargement stopped at a certain point, the increased action of the heart in a great measure subsided, and the patients acquired a tolerable share of health. They are both now alive, and they have the prospect of living, with care, to the ordinary term of life. Such a fortunate issue is very rare ; but the disease may be generally retarded in its progress by much rest of body, quietness of mind, and a very temperate mode of living. Wine and every other fermented liquor should be avoided, and patients under such circumstances should live almost entirely upon vegetable food.

At the middle and more advanced periods of life, palpitation of the heart often depends upon a diseased structure of some of its valves. This condition of the heart does not admit

of any remedy, but must gradually become worse, until life be extinguished. But the symptoms may be mitigated, and the progress of the disease retarded by little exertion of the body, by great temperance, and by a few ounces of blood being occasionally taken from the arm.

ANGINA PECTORIS.

This distressing disease almost constantly depends upon an ossification of the coronary arteries of the heart, and admits of no effectual relief from medicine. I have met with two cases, however, in the course of my medical experience, in which symptoms exactly resembling those of angina pectoris depended upon an imperfect digestion; and the patients ultimately recovered entirely, by correcting the disordered condition of the stomach.

OF DISEASES IN THE CAVITY OF THE ABDOMEN.

ASCITES.

WITH respect to this disease I have very little to say. When it depends upon a morbid state of any of the abdominal viscera,—as for instance, the liver or the spleen,—it is never permanently removed, and very seldom even relieved till the morbid condition of these viscera is cured, if this event should fortunately take place. Even where the viscera in the abdomen are sound, or at least cannot be discovered by an accurate examination to be otherwise, ascites is rarely, according to my experience, cured by medicine. The ordinary diuretic medicines, as squills and digitalis, have commonly very little effect upon it. The medicines which I think upon the whole to have most influence upon this species of dropsy are supertartrate of potash and small doses of elaterium. In two, or perhaps three cases, during my medical ex-

perience, ascites has gradually got well without medicine, after the common remedies had been sufficiently tried and had failed. I can entertain no doubt, from some late publications, that taking away blood from the arm will often be a valuable remedy in ascites, where there has been too much arterial action, or even some degree of inflammation in the early part of the disease; but of this remedy I have not had sufficient personal experience to enable me to appreciate its value.

INFLAMMATION OF THE PERITONÆUM.

Where this disease has not been connected with any peculiarity of season, or any epidemical complaint, I have found it to be cured by bleeding and purging, like other inflammations. Upon the whole, however, I think that it has been more relieved by repeated applications of leeches than by general bleeding. I do not wish it to be understood that general bleeding is of no advantage in peritonitis, for sometimes it produces the greatest benefit. I think, however, that in most cases more benefit will be de-

rived from the repeated application of leeches, according to circumstances, than from a repetition of the general bleeding. The purgative medicines which have appeared to me to be of most value are calomel and the neutral salts.

OF SOME AFFECTIONS OF THE STOMACH.

There is no complaint more common in this country than an imperfect condition of the functions of the stomach. This generally shows itself by more or less of flatulence, by acidity, by a bitter taste occasionally felt in the mouth, and often by some degree of costiveness. This condition of the stomach generally arises from something wrong in the quantity or quality of the food, from anxiety of mind, and from a due degree of exercise not being regularly taken. It makes its progress very gradually, continues always for some months, and often even, more or less, for years.

The first object of attention should be to remove as far as possible the causes which produce it. Every kind of food should be avoided which the patients may have

found, from their own experience, to have disagreed with their stomach. Most commonly animal food that is very fat, or much salted or fried, is difficult of digestion, and should either be eaten very sparingly, or should be altogether avoided. Young and white animal food is in general more difficult of digestion than what is brown and of middle age. The vegetables which are eaten should be very well boiled, and should be taken sparingly by such persons as are subject to flatulence or acidity. The waxy potatoe is almost constantly very difficult of digestion, and in general should be avoided altogether. There should never be so much food taken at a time as to give the feeling of fullness or distention in the stomach; and except under very particular circumstances, there is no advantage in eating oftener than three or four times in twenty-four hours. The best common beverage in disordered conditions of the stomach is water, or toast and water; and three or four glasses of wine may be taken at or after dinner, according to the habits of the patient, or other circumstances. That wine is to be preferred

which agrees best with the stomach, of which he is himself the most competent judge. Daily exercise is almost constantly necessary in order to preserve good digestion. Riding on horseback is upon the whole the best, for it gives a motion to the abdominal viscera, which no other exercise is capable of; but walking is also very useful. A combination of the two is preferable to either; for riding on horseback chiefly exercises the abdominal viscera, and walking chiefly exercises the limbs and the thoracic viscera. Anxiety of mind should be avoided, whenever it can fairly be done; but it is often impossible to take advantage of this remedy.

With respect to medicines, there are none for this complaint which can be called specific. The most beneficial, however, which I have known are rhubarb, and some form of bitter medicine combined with alkalies. Eight grains of rhubarb formed into pills with soap, taken every night at bed-time, and some bitter,—as infusion of cascarilla, calumba, quassia, or gentian, with some grains of soda or potassa dissolved in it,

taken in the morning and before dinner,—will often be very useful in this kind of disordered stomach. These remedies should be continued for five or six weeks at a time, should be omitted for two or three weeks, and occasionally resumed. If the alvine evacuations should be considerably lighter in their colour, or much darker than natural, mercury, given in moderate doses, and not for so long a time as to injure the constitution, will often be of great use. The large and indiscriminate employment of mercury in complaints of the stomach has, I think, been often very hurtful. Where acidity has been particularly prevalent in the stomach, I have sometimes found it more effectually corrected by the diluted mineral acids than by alkalies. Ten or twelve drops of the diluted sulphuric or diluted nitric acid, mixed with an infusion of some bitter, and taken twice a day, will sometimes be very beneficial in this condition of the stomach.

There is an affection of the stomach in which the digestion is very imperfect, and in which considerable quantities of a transparent

viscid mucus is formed. This often produces nausea, and is occasionally brought up by vomiting. According to my experience, this condition of the stomach has been frequently little benefited by medicine; but sometimes I have found the *tinctura benzöes composita* of considerable use. A drachm of it may be taken mixed with water and some mucilage of gum acacia, three times a day.

There is another affection of the stomach less common than the former, but far more serious, viz. where the stomach throws up in large quantity a fluid like cocoa. A quart of this fluid will often be thrown up at a time, and this will frequently be repeated for many days together. This condition of the stomach is sometimes connected with a diseased state of the liver, but sometimes it is independent of it, there being, at least apparently, no disease in this latter organ. In several instances it has proved fatal; but in others, and especially in two cases which I recollect, the complaint subsided for several months at a time, and the persons enjoyed in the interval tolerable health. This state continued many years,

and the patients are still alive. In one case I had an opportunity of examining the condition of the stomach after death. It was very capacious, and was half filled with this brown fluid, but did not appear to be at all diseased in its structure. The neighbouring viscera, as the liver and spleen, were, as far as I recollect, perfectly sound. The fluid would appear to be formed by a diseased secretion of the inner membrane of the stomach, without any apparent morbid structure.

This disease, according to my experience, is but very little influenced by medicine or by diet. In two or three cases some benefit seemed to be derived from astringent medicines combined with moderate doses of opium,—as for instance, from tincture of kino, or tincture of catechu, with a few drops of laudanum, taken three or four times a day. The bowels should be at the same time kept free from costiveness.

In some cases the stomach will lose almost entirely the power of digestion; the patients will become pale and emaciated, and appear as if they were affected by some fatal visceral disease; at the same time no morbid

structure in the region of the stomach or liver can be detected by the most attentive examination. In some of these cases the patients have been completely restored to health by a course of the Bath waters.

OF INFLAMMATION OF THE BOWELS.

OF this very formidable disease I have very little to observe. Where the symptoms had been fully formed, the greater number of cases which I have seen have terminated fatally. One case, however, in which the vomiting was of stercoraceous matter, recovered. The chief remedy in this very dangerous disease, is bleeding largely both from the system, and topically by leeches. It is very desirable that the inflammation should be subdued, or at least be much lessened, before any active purgative be administered. A purgative during the violence of the inflammation will rarely produce any evacuation, and may even do some injury, by stimulating a part still highly inflamed. Fomentations have been very commonly applied to the belly, and they give some temporary relief. I am inclined to think that cold applications may be useful in assisting to subdue the inflammation, but this I have

not hitherto tried. The tobacco glyster, and cold water thrown upon the lower limbs, have in some cases excited the bowels to action when very powerful purgatives had failed.

OF DYSENTERY.

In this disease opiate and astringent medicines have sometimes appeared to me to be administered too early. Mild purgative medicines, of which I think castor-oil upon the whole the best, should be administered till the alvine evacuations have become free from mucus and blood, and have recovered in a considerable degree the appearance of a natural fluid motion. Astringent medicines with opium may then be directed with much advantage. As there is always an inflammatory condition of the bowels in this disease, leeches may be applied to the seat of the sigmoid flexure of the colon, and the upper extremity of the rectum, with a considerable chance of benefit.

OF SOME AFFECTIONS OF THE LIVER.

THERE may be, and often is, a deficiency in the quantity of bile mixed with the alvine evacuations, without any disease in the structure of the liver. The fæces are more or less pale; but there is no hardness nor fullness in the region of the liver. Every thing there, upon the most attentive examination, is discovered to be soft and perfectly natural to the feeling. Mild purgative medicines, with small doses of the *pilula hydrargyri*, are commonly very useful in such cases. Four or five grains of the *pilula hydrargyri* should be given every night for some time, and the purgative every morning or every other morning. The mercurial medicine should not be carried so far as to make any impression upon the constitution, if this can be avoided; it is only intended to stimulate the ducts of the liver. The best purgative medicine, upon the whole, is the sulphate of magnesia in moderate doses, so as

to produce two or three evacuations daily. When the alvine discharges have for some little time resumed their natural colour, the *pilula hydrargyri* should be given up.

Sometimes the bile discharged from the liver is of a dark colour, and the motions become darker than usual. The intensity of the colour differs very much in different individuals, and occasionally it is nearly as black as ink. The liver at the same time may be, and commonly is, quite sound in its structure. The treatment should in this case be in a great measure similar to that in the former, but a little more active. Small doses of calomel may be used instead of the *pilula hydrargyri*, and the purgative medicines may be a little more powerful. When the colour of the motions has for a short time (eight or ten days) become natural, the calomel may be given up; but the purgative medicines may be continued longer, at somewhat greater intervals, as for instance every third day. Where the motions are very green in their colour, magnesia or some alkali may be mixed with the purgatives. In the above cases the Cheltenham and Leamington waters

have been often very useful ; but I think that many practitioners of the present day have erred in administering mercury too long, and in too liberal doses. When mercury is carried beyond the point that is necessary, it often injures the constitution by weakening it, and by rendering the nervous system very irritable.

There is sometimes a greater fullness and greater sense of resistance over the whole region of the liver than natural, with more or less of tenderness upon pressure. This arises from some chronic inflammation of the substance of the liver. In such a case, the repeated application of leeches to the seat of the liver, and the occasional application of a blister, are often of the greatest use. A mild course of mercury should be recommended, so as in some degree to affect the constitution ; and this should be administered both externally and internally. It should not, however, be carried beyond the necessity. Long and repeated salivations will seldom be required, and often have done much and permanent injury to the constitution. When the liver has become soft, has lost its tenderness and

resumed its natural size, the mercury may be given up. If the liver shall not have returned altogether to its natural state, and the constitution appears to be suffering from the course of mercury, a seton may be inserted under the skin in the region of the liver, and the mercury may be given up or suspended. In some cases I have found a fullness of the liver which had eluded the effect of mercury, to be removed by a seton. The administration of purgatives is of great advantage in all such cases, and the Cheltenham waters are often highly beneficial.

OF ABSCESS IN THE LIVER.

Inflammation of the liver will occasionally terminate by forming an abscess. The abscess will in time break externally, or it will communicate with the lungs, with the stomach, or with both of these viscera. When the abscess breaks externally, the part gradually heals unless there be something very unfavourable in the constitution; and the patient recovers entirely. When the abscess communicates with the lungs, the matter is brought up by coughing, and the patient, if

prudent in the management of himself, and possessed of a tolerably good constitution, will sometimes at last entirely recover. When the abscess communicates with the stomach, the matter is sometimes discharged by vomiting, and sometimes by the bowels. In this case, too, the patient will not unfrequently recover; and the same observation may be extended to an abscess of the liver which communicates both with the stomach and the lungs, although the circumstances are more unfavourable in this than in the other two cases. In these various cases little benefit is produced by medicine, but great injury may be done by imprudent or unskilful management. The bowels should be kept always free from costiveness: if there be any considerable feverishness, it may be lessened by saline draughts; or if the constitution be weak, it may be strengthened by the prudent use of tonic medicines. The diet should be light and nourishing, and in general wine should be avoided. The exercise, if the weather be favourable, should be gentle, but it should not be taken at all if the weather be ungenial, or if it be attended with

pain or much fatigue. A stimulating diet, too much or too violent exercise, and exposure to a cold atmosphere, may do much mischief, or even lead on to a fatal event.

OF TUBERCLES IN THE LIVER.

Tubercles of different kinds are formed not unfrequently in the liver at a middle or more advanced age. They are often connected with an intemperate mode of living, but they will sometimes occur in persons who have passed an uniformly temperate life. They are frequently the cause of Ascites, but sometimes they do not produce this effect. No medicines, as far as I have seen, are attended with any permanent benefit in this state of disease. By temperate living, by gentle exercise, and by the bowels being kept rather open, patients will not unfrequently live for some years with such complaints; but I do not recollect any instance of a patient actually recovering from them.

OF HYDATIDS IN THE LIVER.

I have known only two instances of this disease in the living body. The one was in an old lady who had been subject from time to time, for many years, to symptoms very much resembling those of gallstones. At length, after a more severe attack than usual, the constitution gradually sunk and she died. Cysts containing hydatids were discovered upon examination of the body after death.

The other case was that of a young lady who had suffered occasionally a good deal of pain in the region of the liver, and at length passed some hydatids by stool. She for the time recovered, but what became of her afterwards I have never learned. It is obvious that the formation of hydatids in the liver, even when the existence of this disease can be perfectly ascertained in the living body, can receive no essential benefit from medicine. If inflammation should take place in the progress of this disease, it may be removed or lessened by taking away blood from the arm or topically; and if at any time violent pain should occur, it may be

mitigated by opium and the warm bath. The bowels should be kept rather open; and there will always be some advantage in patients affected with this disease living temperately. Patients may live many years with this complaint; but if it be gradually making progress, even though slowly, it must in almost every instance have ultimately a fatal termination.

OF GALLSTONES.

The formation of gallstones in the ducts of the liver or in the gall-bladder is not a rare disease, and I have known many instances of it. The paroxysms of this complaint are generally attended with exquisite pain; but I have known a few cases where the pain has been moderate. Some cases I have likewise known where patients have been subject to symptoms of indigestion for many months, without paleness of the stools, yellowness of the skin, or any other symptoms which denote the existence of gallstones; yet this condition of the stomach has ultimately led on to the symptoms of gallstones being formed in the most distinct manner. It is obvious

that no solvent can be successfully applied to a gallstone within the living body. While the symptoms of gallstone exist, it must either be in some duct of the liver, or in the cystic duct, or in the *ductus communis choledochus*. But a solvent introduced into the stomach cannot come in contact with a gallstone in any of these situations. As soon as a gallstone drops into the duodenum, where a solvent might reach it, all symptoms belonging to gallstones immediately cease ; and for the time the patient becomes quite well. In the treatment of gallstones, therefore, the symptoms can only be mitigated by medicine. If any inflammatory symptoms have been produced, which is sometimes the case, they can be removed or lessened by general and topical bleeding. The exquisite pain which is commonly felt during a paroxysm of gallstones, can be generally mitigated by large doses of opium, by fomentations, and by the warm bath. Purgative medicines should be given, of sufficient power to counteract the effects of the opium. Mercury appears to me to have no power over a pure case of gallstones unmixed with any fullness or hard-

ness of the liver; and the Cheltenham or Leamington waters are of much less advantage than in the more ordinary cases, where the functions of the liver are merely deranged. No particular mode of life will protect a patient against the recurrence of gallstones; but there is always some advantage in such persons living temperately, and keeping their bowels free from costiveness.

OF SOME DISEASES OF THE PANCREAS.

THE pancreas is upon the whole less liable to disease than any other important gland in the body. I do not recollect that in private practice I have met with one case in which there was satisfactory evidence of the pancreas being diseased ; and I have only known of a solitary example of it during the thirteen years in which I was a physician of St. George's Hospital. This case was under the care of another physician*, and the pancreas was not known to be diseased till the patient's body was examined after death. The pain in the epigastric region, sickness, uneasiness or pain in the loins, which belong to inflammation and enlargement of the pancreas, belong also to other diseases, and therefore do not particularly indicate a disease in this important viscus. Were the enlargement so great that it could be ascertained by an at-

* Dr. Heberden, junior.

tentive examination of the living body, no difficulty would remain in ascertaining the disease. This, however, will very seldom happen; for I have not found a single instance in all the dead bodies which I have examined, of the pancreas being so large that it could have been ascertained by the most careful examination in the living body. If the pancreas were to be much increased in size, and the patient much emaciated, so as to ascertain this disease while the patient was alive, it would probably be, in general too late to receive any substantial benefit from medicine.

Calculi formed in the ducts of the pancreas constitute a still rarer disease than the inflammation or enlargement of this gland. I have not myself met with any instance of it in the living body, nor do I remember to have heard any physician say that he has seen this disease. While the calculi remain within the ducts of the pancreas, it is evident that no solvent could reach them; and if they should be discharged into the duodenum, there would be a cessation of the disease for a time.

OF SOME DISEASES OF THE SPLEEN.

THE spleen is much less subject to inflammation than many other of the abdominal viscera. I do not recollect a strongly marked instance of it in my practice, and I have never met with an abscess in the spleen in all the dead bodies which I have examined. The peritonæum is not uncommonly inflamed in that quarter, and the coat of the spleen is more or less involved in the inflammation. I am not aware that inflammation of the spleen would require a different treatment from that of other viscera.

I have met with several examples of enlargement of the spleen. The enlargement has been very different in different patients. In some the spleen has not been more than twice its natural size, and in others it has been so large as to occupy nearly all the left side of the abdomen, extending from the diaphragm to the pelvis. When the enlargement is so considerable that the lower end of

the spleen can be felt under the margin of the ribs upon the left side, there can be no doubt with respect to the disease. The spleen when enlarged is always felt to be harder than in a natural state, but pressure upon it with the hand seldom produces pain. An enlargement of the spleen is sometimes followed by Ascites; but there will frequently be no dropsy of the abdomen, even where the spleen has been for a long time much enlarged. Where enlargement of the spleen has been connected with ague, it more frequently subsides than in any other case: where the enlargement has taken place independently of this cause, it hardly ever subsides of itself, or is materially diminished by medicine. According to my experience, mercury, administered both externally and internally, produces very seldom any good effect: I have seen, I think, more advantage from a seton inserted under the skin which covers the spleen. In some cases it has appeared to be diminished in size by this remedy, and to be rendered softer; but I do not recollect a single instance, except after ague, in which it has been reduced to nearly

its natural size. Temperate living, abstaining from violent exercise, and keeping the bowels open, must be to a certain degree useful in retarding the progress of the disease.

I have not met with any case of hydatids being formed in the spleen; but such a disease now and then occurs. A patient may live very long with this complaint; but it can receive no cure, nor even amendment, from medicine.

OF SOME AFFECTIONS OF THE KIDNEYS.

THE kidneys are more liable to disease than most other glands of the body, and are more frequently diseased in men than in women. This may arise from greater intemperance in the former than in the latter sex, and likewise from the more violent bodily exertions which men are often called upon to make. I have known a few instances in which the two kidneys entirely lost the action of separating urine; and this has been chiefly in persons advanced in life. The patients soon became very comatose, and died in the course of two or three days: no medicine was of the least advantage; and every case, as far as I recollect, terminated fatally. There is a great difference, in the hazard of a patient's situation, whether the kidneys separate a little urine or none at all. In the first case they generally recover, and in the second very rarely. It is curious that life should

terminate so soon when the functions of the kidneys have become totally suspended. A person who receives no nourishment whatever into the stomach, or by any other means, will live much longer.

OF ABSCESES IN THE KIDNEYS.

When inflammation of the kidney has not been removed by the usual means, an abscess takes place in it. The pus which is formed is sometimes of a common kind, but is often of a strumous nature. It comes away along with the urine, in greater or less quantity; and this circumstance, together with the history of the case, ascertains in the most satisfactory manner the nature of the disease. The kidney in such cases is sometimes nearly of its natural size, but is often much enlarged; and this circumstance can be ascertained by an examination in the living body. Patients will continue to live with this complaint for many months, and even for several years. The formation of matter will sometimes be suspended for several months, and patients will recover in a considerable degree

their general health. The disease will return either from imprudence in diet or exercise, or without any known cause, and the patient will become as ill as ever. It very rarely happens that a patient permanently recovers from this disease, and I do not at present recollect an instance of it. Medicines, as far as my experience has reached, do not produce any great or permanent good effect. A seton inserted in the loins, or in the flank of that side where the diseased kidney is situated, is sometimes of considerable use. The uva ursi, and the tinctura benzöes composita, have sometimes been serviceable as internal medicines. The same observations may extend to cooling and mucilaginous remedies. Great quiet of body and uniform temperate living are useful in mitigating symptoms, and retarding the progress of the disease. A patient labouring under this complaint should live almost entirely upon vegetable food, and should abstain from wine and other fermented liquors.

OF HYDATIDS IN THE KIDNEYS.

This is a very rare disease, but I have known two or three instances of it. Its existence cannot be ascertained in the living body, unless an hydatid should occasionally be discharged along with the urine through the urethra. A patient may live very long, perhaps a good many years, with this disease, but it cannot receive any advantage from medicine.

OF CALCULI IN THE KIDNEYS.

One of the most common diseases of the kidneys is the formation of calculous matter in them. This may either be in the form of sand, producing in the kidneys temporary irritation; or in the form of a calculus, which may either produce temporary irritation, or a permanent and fatal disease. When the calculus is small and of a favourable shape, it may pass by one of the ureters into the bladder, and be altogether discharged from the body by the urethra. When the bulk of the calculus is considerable, and more especially if it be of an arborescent form, it can-

not pass into the bladder, but must remain in the kidney, or in the pelvis of the ureter very near the kidney, producing there more or less of irritation, frequently some degree of inflammation, and not unfrequently an abscess. The existence of a calculus in the kidneys may be guessed at with high probability from the symptoms ; but it can only be perfectly ascertained when sand or small fragments of calculous matter are occasionally discharged through the urethra. In the treatment of this formidable complaint, symptoms of inflammation, when present, should always be promptly removed by general and topical bleeding, by cooling and mucilaginous medicines, and by mild purgatives. When the inflammation is removed, the proper medicines should be determined by the nature of the calculus, where this can be ascertained. If the calculus be of the common kind, (consisting chiefly of lithic acid,) magnesia and alkaline medicines should be given, and be continued for a great length of time. If the calculus should consist of the triple phosphate, moderate doses of some of the mineral acids, properly diluted, should be given ; and

of these the muriatic acid is perhaps the best. I do not recollect any instance in which patients have by these medicines been permanently cured; but I have not unfrequently known the symptoms very much mitigated by them, and even for a time suspended.

Patients labouring under this complaint should live with great temperance, but should adopt chiefly a light animal diet, because, if acid be formed in the *primæ viæ* in considerable quantity from vegetable food, the symptoms of the complaint will probably be aggravated.

OF HÆMORRHAGE FROM THE KIDNEYS.

I have known a few cases in which blood has been discharged from the kidney, and has passed out of the body along with the urine. In most of these cases the quantity of blood has been large, amounting often to nearly a pint at a time, so that the mixture of urine with the blood hardly appeared to dilute it. The recurrence of the bleeding is commonly very frequent, and the disease will often continue with intermissions for several

weeks. The loss of blood must arise from one or more considerable vessels being ruptured in one or both kidneys ; but I believe that generally one kidney only is affected. The blood-vessels of the kidney may be so distended with blood, that one or more of them may burst ; or the sharp edge of a calculus may cut through one or more of them, and in this way occasion the hæmorrhage. Whether the hæmorrhage has been produced in the one way or the other, can generally be determined by an accurate attention to the history of the case.

General and topical bleeding, but more especially the latter, are sometimes of great use in mitigating the disease. Cold applications to the loins and belly are also very serviceable. As internal medicines—nitre, the diluted sulphuric acid, and the tincture of muriated iron, have often produced great benefit. The last medicine has, I think, upon the whole been the most useful.

The patient should be kept perfectly quiet, the chamber cool, and the diet for a time should consist entirely of vegetable sub-

stances. I do not recollect any instance in which the patient has not recovered from this complaint, when it has not been connected with an abscess, or some other formidable disease of the kidney.

OF DIABETES.

I have in the course of my medical life seen a good many instances of this formidable disease. Of late years a considerable proportion of such cases have got well under my care, or have had the symptoms very much mitigated. The most successful plan of treatment has been, to give considerable doses of opium combined with rhubarb or some other bitter: fifty drops of laudanum, for instance, may be given three or four times a day, mixed with some infusion of rhubarb or infusion of calumba. The rhubarb may also be given separately in the form of pills. Under this treatment the disease will often gradually subside, and at length cease altogether. It is, however, very apt to recur, and therefore this plan of treatment, in more moderate doses, should be continued for some months after the patient is apparently well. Bleeding

from the system generally, and topical bleeding from the loins, are often useful ; for the blood-vessels of the kidneys in this disease are generally more or less distended with blood. The diet should be temperate, and should consist chiefly of animal food ; and the best kind of drink is, upon the whole, Bristol water.

OF A LOOSE TUMOUR IN THE REGION OF THE KIDNEY.

In four or five instances I have felt a loose tumour in the situation of one of the kidneys, which could be easily moved up and down with a slight pressure from the hand. The tumour is of considerable firmness, and has a good deal the shape and size of the kidney. It is attended with very little uneasiness to the patient, and the general health is very little, if at all, affected by it. When felt in women, it has been mistaken for an enlarged ovarium ; but it has neither the shape of an enlarged ovarium, nor is it in the situation in which an enlarged ovarium is commonly found. I have not had an opportunity of examining this disease in the

dead body; I am therefore not certain about its nature, but I am rather disposed to think that it is a kidney more loosely attached than usual to the subjacent and surrounding parts.

OF SOME DISEASED AFFECTIONS OF THE URINARY BLADDER.

It is not unusual for the urinary bladder to become for a certain time paralytic, and to lose its power of expelling the urine. This is more apt to occur in young women than in any other persons, and for the following reason. The complaint is generally produced by the calls to evacuate the urine being resisted, so that the muscular coat of the bladder becomes very much stretched in consequence of the accumulation of the urine. By the stretching of the muscular coat, its power of acting as a muscle is for a considerable time lost, and is only gradually recovered. Young women, from being long in a carriage, or long in company, and from their natural modesty, often resist the desire to evacuate the urine for such a length of time as to induce a paralytic state of the muscular coat of the bladder. Older women manage this function more wisely ; and men are not much exposed to the causes which induce them to resist the

desire of evacuating the urine.—When this disease has taken place, and is not accompanied with any morbid change of structure in the bladder, the bladder gradually recovers its power by the water being regularly drawn off twice or thrice in twenty-four hours for some weeks. Women may soon be taught to draw off the water themselves, so that they may avoid the very distressing assistance of a surgeon, as well as have an opportunity of relieving themselves whenever there is the least painful distention of the bladder. Internal medicine is of no use in this complaint, but the diet should be temperate, and drink should be taken sparingly.

The bladder will sometimes have only its sphincter muscle paralytic, while the muscular coat of the bladder shall retain its natural power. This complaint prevents the water from being properly retained; and when there is a certain accumulation of urine in the bladder, it passes off involuntarily. This species of complaint is more common in persons advanced in life than in young persons, and more common in men than in women. The sphincter muscles generally

throughout the body become more weak at an advanced period of life ; and the bladder of men is more exposed through life to the causes which impair its powers, than that of women. When this disease has taken place, it is seldom entirely cured. It is occasionally benefited by small blisters being applied to the perinæum or near the neck of the bladder. Tonic medicines of different kinds, and proper doses of the *tinctura lyttæ*, are sometimes attended with advantage.

OF A DISEASED SECRETION FROM THE BLADDER.

The inner membrane of the bladder, more especially near its neck, has the power of secreting mucus, and is always secreting it in a small quantity, in order to protect the internal surface of the bladder against the stimulus of the urine. This secretion is sometimes very much increased in persons at a middle or advanced age, and is a good deal altered in its properties. Instead of being in a great degree transparent and void of colour, it becomes opaque and yellow, so as very much to resemble pus. It becomes

what is now generally called purulent mucus, and will often be nearly equal in quantity to the urine itself. When the urine has been evacuated, and has been allowed to rest in a vessel for a little time, the purulent mucus subsides from the urine, and often adheres with considerable tenacity to the sides of the vessel. This mucus is often formed, without there being any morbid structure in the bladder, or any substance contained in the bladder which produces irritation; but it almost constantly attends more or less the presence of a calculus there.

When this complaint is independent of a calculus, it commonly receives but little benefit from medicine. The balsam of copaiba, the uva ursi, and soda, sometimes appear to be useful, but they very seldom produce any considerable or permanent good. When the existence of a calculus in the bladder is the cause of the disease, the removal of the calculus will effectually cure it.

OF A CALCULUS IN THE BLADDER.

When a calculus is in the bladder, the disease can in general be ascertained by an accurate attention to the symptoms ; but it can always, or almost always, be ascertained in a satisfactory manner by a sound or catheter being introduced into the bladder by an experienced surgeon. I have known a good many instances in which this disease has been alleviated by medicines, but none in which it has been cured. Mucilaginous substances, fomentations, opiates, magnesia, and alkaline remedies are sometimes of considerable use in lessening the symptoms. Where the calculus has been ascertained, by portions of it or by gravel which may have been occasionally discharged with the urine, to consist of the triple phosphate, much advantage has sometimes been derived from taking moderate doses of the muriatic acid properly diluted.

OF A COMMUNICATION BY ULCER BETWEEN
THE BLADDER AND THE RECTUM.

I have known two cases of this kind ; one of which was in a man, and the other in a

woman. They both lived between two and three years, but they died from the consequences of the disease. Both sometimes suffered considerable pain in the very lower part of the abdomen, but they were both often quite free from pain for many hours together. The pulse was sometimes of a natural frequency, and sometimes was accelerated. It hardly ever happened that urine escaped from the bladder into the rectum, but very often air escaped from the rectum through the urethra, and frequently more or less of fæces was discharged by the same channel. Whenever fæculent matter was discharged by the urethra, great pain was felt about the neck of the bladder. It is very obvious that medicine could be of no substantial use in those cases. Opiates, fomentations, and mild purgatives sometimes produced an alleviation of the symptoms, but the constitution became at length very much exhausted, and the scene was then soon closed.

OF SOME DISEASED AFFECTIONS OF THE WOMB.

ONE of the most common diseases of the womb is prolapsus uteri. It is in very different degrees in different individuals. In some the womb is only a little lower in its situation than it ought to be, but the mouth of the womb is still considerably within the vagina. In others the neck of the uterus shall be at the external opening of the vagina; and in a few a considerable portion of the womb shall be without the body.

According to my experience, this disease, when in a considerable degree, is often very imperfectly relieved. When the degree of it is slight, and the vagina not very relaxed, the complaint may sometimes be removed by a horizontal posture being continued throughout the greater part of the day for several months, by the judicious use of tonic medicines, and by astringent fluids being injected into the vagina twice a day. In a moderate degree of the prolapsus, pregnancy taking

place has often proved the means of curing the disease.

When the prolapsus is in a great degree, both internal and external remedies have generally been of little use. The inconveniencies, however, of the disease may in a great measure be prevented by a pessary being constantly worn in the vagina. When the pessary is well adapted to the circumstances, it does not produce pain, and in time the patient is hardly sensible of its presence. I need not say that the pessary should be removed for a few minutes every two or three days, in order that it may be cleaned and not produce irritation.

OF POLYPUS OF THE WOMB.

This disease, although by no means so common as the former, is not very rare, and I have not unfrequently been consulted about it. If the symptoms be not inquired into with some attention, it may be confounded with the malignant ulcer, or what is usually called Cancer of the womb ; but a minute inquiry into the symptoms will enable the practitioner in most instances to distinguish be-

tween the two diseases. When an examination has been made *per vaginam*, no doubt can remain; and therefore, before an opinion is decidedly given, an examination should always be made.

In this disease no permanent advantage is gained by medicine. The strength of the constitution may be a little kept up by tonic and astringent medicines, and the profuse discharges of mucus and blood may be moderated by the application of cold and astringent fluids; but the disease can only be removed by an operation, which consists in tying the neck of the polypus by a ligature. This can be done safely, and with great dexterity by many practitioners in midwifery. In a few days after the operation, the polypus drops off, and the patient gradually recovers her usual health. In many instances the polypus does not return; but a new polypus is occasionally formed, which in due time may be removed by a similar operation.

OF CANCER OF THE WOMB.

This disease is not uncommon, more especially at the middle and more advanced periods of life, and I have frequently been consulted respecting it. I have never known any medicine produce the least real amendment of the disease. Opium and other sedatives will not unfrequently relieve the greater attacks of pain; and in that way will prevent the constitution from being so soon worn down by the disease. It is to be observed, however, that different women suffer naturally very different degrees of pain in this fatal disease, and that its progress is much more slow in one woman than another. The diet should always be very temperate, consisting chiefly of vegetable substances, and the patient should abstain from wine and other fermented liquors.

OF AN ENLARGEMENT OF THE WOMB.

This disease is not uncommon, although by no means so frequent as cancer of the

womb. It is more apt to occur at or near the middle period of life than at any other, and may be distinguished by a moderate attention to the circumstances of the case. There are considerable mucous discharges by the vagina, as in some other diseases of the womb, and the monthly evacuations are profuse. When the disease has made some progress, a tumour of a pyramidal shape and of considerable hardness may be felt immediately above the pubes. The neck of the uterus is likewise found to be enlarged by an examination *per vaginam*. These circumstances sufficiently characterize the disease. It generally continues for many years, and the general health is often not much affected by it. In the course of my experience I have known three cases of this disease cured by medicine. Five or six grains of the pilula hydrargyri were directed to be given every night for many weeks, from half a pint to a pint of decoction of sarsaparilla was ordered to be drunk daily, and a large mercurial plaster was applied over the tumour and the whole lower part of the abdomen. The dis-

ease in these instances gradually subsided, and at length disappeared altogether. One of these patients, who was about thirty-five years of age, afterwards became pregnant, and bore a very healthy child.

OF SOME DISEASED AFFECTIONS OF THE OVARIUM.

THE most common disease of the ovarium is that of its being dropsical. It may take place at almost any period of life. It is not unusual in young women, and often occurs about the middle age. This disease may in general be readily distinguished from Ascites by an examination of the swelling, which is almost constantly more or less uneven upon its surface, and often more or less hard in different parts of it. Sometimes, however, in Dropsy of the ovarium, when the disease is of considerable standing, the swelling is uniform, and a sense of fluctuation is felt upon striking the tumour with the hand, almost as distinctly as in Ascites. Under such circumstances the two diseases will be distinguished from each other by inquiring accurately into the history of the case.

I do not recollect any instance in which Dropsy of the ovarium has been materially diminished by medicine. I have long, there-

fore, given up the trial of active remedies in this disease, which I have found to be ineffectual, and sometimes injurious to the constitution. I have contented myself with keeping the bowels regular, and with directing such diuretic medicines as would not impair the general health. I have not found mercury, even when continued for several months together, and having its full influence upon the constitution, produce a cure or any material change in this disease. The disease will sometimes remain stationary for a good many years, and the general health will be very little impaired by it. In one instance, after it had existed for nearly thirty years, the disease disappeared spontaneously, and the lady, who is still alive, remained afterwards in good health. In three cases where the women were young, and the dropsy confined to one large cyst in the ovarium, I have known them to be effectually relieved by tapping, and the disease not to return for several years. In one of these the dropsy did not return for ten years. When the patient is young, and Dropsy of the ovarium under favourable circumstances, it is always

worth while to make a trial of this remedy. When the Dropsy of the ovarium is composed of several cysts, the disease may be partially relieved by tapping; but it almost constantly returns, and after a certain time very rapidly, so that there is only a short interval between the operations. Still, however, some relief is afforded by each operation; and patients will be ready to undergo the operation for this relief every two or three months for several years.

A firm swelling, about the size of the fist or a large orange, is sometimes to be felt in the situation of the ovarium, either upon the right or the left side of the abdomen. It will sometimes remain stationary, will sometimes go on enlarging to a much greater size, and is not, as far as I have seen, suppressed by any remedy. This solid structure of the ovarium is found not uncommonly blended with the dropsical cysts which have been lately mentioned.

OF MY EXPERIENCE IN FEVERS.

WHILE I was a physician of St. George's Hospital, which was during a period of thirteen years, I saw a good many cases of typhous fever. There were generally three or four cases of such fevers under my care at a time. Since I have ceased being a physician to that hospital, and more especially since my patients have been chiefly in the upper ranks of society, I have not seen more than three or four of such fevers in a twelvemonth. With respect to the contagious nature of these fevers, I am convinced that it is in general not considerable. I do not recollect an instance in which a patient in that hospital communicated the infection to a patient lying in the next bed. When patients are crowded together, and the apartments are ill ventilated, I entertain no doubt of this species of fever being capable of being communicated readily from one individual to another.

These fevers are sometimes without any

symptoms which denote a local affection of a vital organ, but very frequently there are symptoms which indicate an inflammatory action of some of the viscera in the chest or belly, or of the brain.

In these fevers I have met with no remedies which possess any specific powers of cure, or which are capable of shortening in any material degree their duration. Before they are fully formed they are sometimes cut short by an emetic, by active purgatives, by profuse perspiration, or by cold affusion; but when they are quite established, I do not recollect that I have seen any instance in which they have been shortened by these means. The most successful method of treating these fevers, as far as I have seen, is to remove or mitigate the symptoms as they arise. The symptoms denoting an affection of the brain should be relieved as speedily as possible by cupping, leeches, and the application of cold to the head. Cloths dipped in iced water, and kept almost constantly applied to the shaved scalp, have appeared to me more effectual in removing delirium than any other remedy.

When there is pain in any part of the chest or difficulty of breathing, these symptoms should be relieved as soon as possible by cupping or leeches, or blisters, and by saline medicines.

If there be any pain in the abdomen, or any symptoms denoting an affection of the liver, the stomach, and the bowels, these are to be relieved by their appropriate remedies.

If there be too vigorous a circulation over the body, without any apparent local affection, it may be corrected by a very cautious bleeding from the arm, by purging, and by saline medicines. If the actions of the constitution be feeble, they may be strengthened by tonic and stimulating remedies, the best of which I believe to be wine in suitable doses. By this mode of treatment fevers will often terminate favourably, which otherwise would have been fatal.

During the greater part of the time in which I have practised medicine, physicians in general, and myself among that number, have, I believe, been too sparing in taking away blood in typhous fever. It was hardly ever directed to be taken away from the arm,

and not often locally, except by the application of leeches to the head. Of late years many physicians have gone into the opposite extreme, and have taken away blood too profusely. In the course of a few years this remedy, like every other, will find its proper level. During the course of a fever, patients require but little nourishment, and this should in a great measure consist of farinaceous matter. Even when the fever has entirely subsided, animal food should be taken for some time very cautiously and sparingly. I have known some instances of the most serious relapses of fever from patients having taken animal food too soon and in too large quantity; and I am disposed to think that the greater number of relapses arise from this cause.

OF INTERMITTENT FEVERS.

I have always practised in London, and have therefore not had many cases of intermittent fever under my care. While I was a physician of St. George's Hospital, I perhaps saw five or six cases of it in a year; and this chiefly occurred among the poor Irish who

lived or lodged in St. Giles's. In some of these cases the origin of the disease could be clearly traced to marshy effluvia; but in others this cause could not be traced, as the patients reported that they had lived in St. Giles's for several years, and had always been employed as labourers in London. They may, however, have been exposed to marshy effluvia in the neighbourhood of London, without knowing or recollecting it.

I have known a good many cases in which bark alone would not cure an ague. In all of these cases, as far as I now recollect, when a grain of calomel was given every night for eight or ten nights, bark cured the ague in the course of a few days. This practice I learnt from my friend Dr. David Pitcairn. The powder of bark I consider as a more efficacious remedy for agues than the extract of bark.

According to my experience, arsenic cures agues in general sooner than bark, and produces no bad effect if it be given in proper doses, and be not continued too long. When the ague has been stopped for three or four days, the arsenic should be given up, and

half a drachm of bark, in powder, should be given three or four times a day, for perhaps a week.

I have known some cases of ague cured by the powder of calamus aromaticus, and I have understood that it is not an uncommon remedy among the lower orders of people in Sussex.

THE END.